GNB INDUSTRIAL POWER
A Division of Exide Technologies

# SCR SERIES CHARGERS

I & O MANUALS

Section 93.20
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JA0132-00

# INSTALLATION & OPERATING INSTRUCTIONS FOR SCR & SCRF SERIES BATTERY CHARGER WITH SINGLE PHASE INPUT

# **SCR/SCRF SERIES** BATTERY CHARGER SPECIFICATIONS

**JF0026-00**

| | | | | | |
|---|---|---|---|---|---|
| **MODEL No.** | | **INPUT VOLTAGE** | | **Vac** | |
| [1] **SERIAL No.** | | **FLOAT VOLTAGE** | | **Vdc** | |
| **SMART PART No.** | | **EQUALIZE VOLTAGE** | | **Vdc** | |
| (items A-F req'd) | [1] **CORE (BB####)** | **A B C D E F G H J K L M N** | 1 - Serial Number and Core (BB####) calculated by factory | | |

| Pos. | SMART PART CODE | DWG# | SHT # | DESCRIPTION | (X) | DWG# | SHT # | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **A** | U | | | UNFILTERED DC OUTPUT | | EJ0088 | 4 | GROUND DETECTION INDICATOR LIGHTS |
| | F | | | FILTERED DC OUTPUT (30 mV RMS w/BATTERY) | | EJ0095 | 4 | 2% ACCURACY 3.5in AC VOLTMETER (1PH) |
| | E | | | BATTERY ELIMINATOR DC OUTPUT FILTERING | | EJ0120 | 4 | BATTERY DISCHARGE ALARM & IND. LIGHT |
| **B** | 1 | | | 120 Vac - 60 Hz INPUT (SINGLE PHASE ONLY) | | EJ0121 | 4 | 2% ACCURACY 3.5in AC VOLTMETER (3PH) |
| | 2 | | | 208/240 Vac - 60 Hz INPUT | | EJ0123 | 4 | COMMON ALARM BUZZER |
| | 3 | | | 220/240 Vac - 50/60 Hz INPUT (SINGLE PHASE ONLY) | | EJ0134 | 4 | 2% ACCURACY 3.5in AC AMMETER (1PH) |
| | 4 | | | 380/416 Vac - 50/60 Hz INPUT (THREE PHASE ONLY) | | EJ0135 | 4 | 2% ACCURACY 3.5in AC AMMETER (3PH) |
| | 5 | | | 480 Vac - 60 Hz INPUT | | EJ0137 | 4 / 5 | CURRENT LIMIT ALARM & IND. LIGHT (1PH / 3PH) |
| | 6 | | | 120/208/240 Vac - 60 Hz INPUT (SINGLE PHASE ONLY) | | EJ0138 | 4 | 0-CENTER DC AMMETER FOR BATT/LOAD MONITOR |
| | 7 | | | 208/240/480 Vac - 60 Hz INPUT | | EJ0143 | 4 | END OF DISCHARGE ALARM & INDICATOR LIGHT |
| | 0 | | | Vac Hz INPUT (CUSTOM) | | EJ0145 | 5 | CABINET HEATER STRIPS |
| **C** | F | | | REDUNDANT DC FUSE PROTECTION (F1 / F2) | | EJ0155 | 1 | HIGH-LOW AC VOLTAGE ALARM & INDICATOR LIGHTS |
| | B | | | STANDARD DC CIRCUIT BREAKER (F1 / CB2) | | EJ0439 | 1 | OVER-TEMPERATURE ALARM w/ (BUZZER / IND.) |
| | C | | | CUSTOM DC PROTECTION | | EJ0615 | 1 | DC POWER ON INDICATOR LIGHT |
| **D** | 1 | EJ0450 | 1 | MANUAL FLOAT / EQUALIZE SWITCH | | EJ082X | 1 | INTERNAL TEMPERATURE COMPENSATION (PB/NICD) |
| | 2 | EJ0093 | 4 | MANUAL FLOAT / EQUALIZE SWITCH & IND. LIGHTS | | EJ1123 | 2 | 4-20 mA TRANSDUCER Adc Vdc |
| | 3 | EJ0097 | 5 | 0-72 HR. MANUAL EQUALIZE TIMER | | EJ1165 | 1 | HIGH AC RIPPLE ALARM w/ INDICATOR LIGHT |
| | 4 | EJ0869 | 2 | MAN. EQUALIZE TIMER w/ F/E SWITCH & IND. LIGHTS | | EJ1234 | 1 | AC INPUT LIGHTNING ARRESTOR (1PH / 3PH) |
| | 5 | EJ0131 | 1 | AC FAILURE AUTO-EQUALIZE TIMER & IND. LIGHTS | | EJ1247 | 1 | VENT FAN CONTROL RELAY & IND. (FROM EQUALIZE) |
| | 6 | EJ0096 | 4 | 0-72 HR. MANUAL EQUALIZE TIMER & IND. LIGHTS | | EJ1303 | 1 | BATTERY OPEN ALARM & IND LIGHT |
| | 0 | | | CUSTOM EQUALIZATION | | EJ1398 | 1 | EXTERNAL TEMP COMPENSATION PROBE (PB/NICD) |
| **E** | 2% | | | 2% ACCURACY 3.5in ANALOG DC METERS | | EJ5005 | 1 | 0-72 HR. MAN. EQ. TIMER & IND. w/ REMOTE EQ. |
| | 1% | | | 1% ACCURACY 3.5in ANALOG DC METERS | | EJ5012 | 1 | 0-999 HR. MAN. EQUALIZE TIMER w/ SW & IND. LIGHTS |
| | SB | | | 1% ACCURACY 4.5in SWITCHBOARD DC METERS | | EJ5087 | 1/2 | AUXILIARY CONTACTS (TB15-AUX) ON CASM (EJ0837) |
| | DM | EJ0895 | 1 | 0.1% ACCURACY 3.5in LED DIGITAL DC METERS | | | | SURGE WITHSTAND FILTER (SWC) PER **IEEE-472** |
| | CM | | | CUSTOM DC METERS | | | | kAIC AC kAIC DC CIRCUIT BREAKERS |
| **F** | P | | | STANDARD (COLOR-CODED PVC) WIRING | | | | 200 kAIC AC FUSING (1PH - 2-POLE / 3PH - 3-POLE) |
| | H | CB0002 | | SWITCHBOARD INSULATION SYS. (#-CODED) WIRING | | | | AC DC CKT BKR AUX CONTACTS |
| **G** | A | EJ0085 | 7 | AC POWER FAILURE ALARM & INDICATOR LIGHTS | | | | COPPER GROUND BUS BAR w/ LUG(S) |
| | C | | | CUSTOM AC FAILURE ALARM | | | | FUNGUS PROOFING PER **CA0004-00** |
| **H** | C1 | EJ0837 | 1 | CASM PC BOARD w/ ONE (1) FORM-C CONTACTS | | | | SPECIAL NEMA CABINET TYPE |
| | C2 | EJ0837 | 1 | CASM PC BOARD w/ TWO (2) FORM-C CONTACTS | | | | in RELAY RACK MOUNTING ASSY. |
| | HL | EJ0083 | 7 | HIGH / LOW DC VOLTAGE ALARM & IND. LIGHTS | | | | SPECIAL (FLOOR / WALL) MOUNTING ASSY. |
| | ZC | EJ0127 | 1 | CHARGER FAILURE ALARM (NO Adc) & IND. LIGHTS | | | | CUSTOM TAG PLATE |
| | HZ | | 7 / 5 | HLVA / CFA & IND. LIGHTS (EJ0083 & EJ0127) | | | | ENGRAVED FUNCTIONAL NAMEPLATES |
| **J** | S | EJ0094 | 4 | GND. DET. SWITCH FOR DC VOLTMETER INDICATION | | EJ5007 | -00 | WHITE CHARACTERS ON BLACK BACKGROUND |
| | L | EJ0089 | 5 | GND. DET. IND. LIGHTS w/ GROUND & LAMP TEST | | EJ5007 | -10 | BLACK CHARACTERS ON WHITE BACKGROUND |
| | R | EJ0086 | 4 | GND. DET. RELAYS w/ RESET SWITCH & IND. LIGHTS | X | JH0002 | -09 | PARTS DATA PACKAGE PER MFG. SWITCHBOARD |
| **K** | F | EJ0133 | 1 | PARALLEL CHGR OPERATION w/ 2% LOAD SHARING | X | JH0002 | -07 | COPY OF TEST DATA PER **NEMA PE5-1985** |
| **L** | H | EJ0592 | 1 | HIGH DC VOLTAGE CHARGER SHUTDOWN | | | | EXTRA INSTRUCTION MANUALS |
| **M** | R | EJ0141 | 1 | COMMON ALARM RELAY CONTACTS | | JH0003 | | CUSTOM DRAWING PACKAGE CAD DISK |
| | B | EJ0141 | 2 | COMMON ALARM RELAY CONTACTS w/ BUZZER | | JH0002 | -06 | CERTIFIED TEST DATA PER **NEMA PE5-1985** |
| | C | EJ0967 | 1 | COMMON ALARM BUZZER FOR CASM PC BOARD | | JH0002 | -03 | CERTIFICATE OF CONFORMANCE |
| **N** | D | EI5030/31 | 1 | DRIP SHIELDS - STYLE-1A/1B CABINET (EB0220/221) | | JH0002 | -01 | BURN-IN OR HEAT-RUN HOURS |
| | D | EI5032 | 1 | DRIP SHIELDS - STYLE-2 CABINET (EB0222) | | JH0002 | -00 | IN-HOUSE INSPECTION BY OUTSIDE PERSONNEL |
| | D | EI5033 | 1 | DRIP SHIELDS - STYLE-3 CABINET (EB0123) | | JH0004 | -01 | EXPORT PACKING PER **FS0001-00** |
| | D | EI5034 | 1 | DRIP SHIELDS - STYLE-4 CABINET (EB0163) | | JH0004 | -05 | CUSTOM PACKING |
| | D | EI5035 | 1 | DRIP SHIELDS - STYLE-5 CABINET (EB0198) | | JH0004 | -10 | EXTENDED WARRANTY PER **JF5001-00** |

**GENERAL SPECIFICATIONS:**

| | | |
|---|---|---|
| Regulation: | + or - 0.5% | no-load to full-load |
| Regulation: | + or - 0.5% | for + or - 10% AC line variation |
| Regulation: | + or - 1% | for combined load, line & temp. variations |
| Ambient Temperature Range: | | 0º C to 50º C |
| Relative Humidity: | | up to 95% without condensation |
| Altitude: | | up to 1,000m above sea level |

**ADDITIONAL FEATURES / OPTIONS / NOTES:**

# IMPORTANT SAFETY INSTRUCTIONS

1) Before using the battery charger, read all instruction and cautionary markings on: A) battery charger, B) battery, C) equipment connected to charger and battery

2) This manual contains important safety and operating instructions, and therefore should be filed for easy access.

3) Do not touch any insulated parts of the battery charger, especially the input and output connections, as there is the possibility of electric shock.

4) During normal operation, batteries may produce explosive gas. NEVER smoke, use an open flame, or create arcs in the vicinity of the charger or battery.

5) Maintain at least 1ft (0.3m) clearance from all obstructions on all sides of the battery charger.

6) Keep area in front of battery charger clear for at least 4ft (1.3m).

7) Connect or disconnect the battery only when the battery charger is off to prevent arcing or burning.

8) De-energize all AC and DC inputs to the battery charger before servicing.

9) Do not operate battery charger if it has been damaged in any way. Refer to qualified service personnel only.

10) Do not disassemble battery charger. Only qualified service personnel should attempt repairs. Incorrect reassembly may result in explosion, electrical shock, or fire.

11) Do not install the battery charger outdoors, or in wet or damp locations unless specifically ordered for that environment.

12) Remove all jewelry, watches, rings, etc. before proceeding with installation.

# PLEASE READ AND FOLLOW ALL SAFETY INSTRUCTIONS

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# SECTION II
# INSTALLATION AND OPERATION

## 1. SAFETY NOTICE

**CAUTION!** READ "**IMPORTANT SAFETY INSTRUCTIONS**" ON PAGE i.

There are dangerous voltages within the battery charger cabinet!

a. Only qualified personnel should attempt to adjust or service this equipment.

b. Refer to instruction manual for service procedures and **CAUTION** notes.

## 2. APPLICATION

Specifications: The silicon controlled rectifier is designed to maintain a system voltage within + or - 0.5% of the set value without exceeding its rated output current. It will maintain + or - 0.5% with input voltage variations 10% above or below the rated input AC voltage and with 5% frequency variations.

The charger is designed, primarily, to operate only when connected to a battery load. It can be operated as a battery eliminator into a resistive load up to full rated output at increased ripple. Filtered type chargers will have a ripple content less than 30 mV RMS under steady state conditions with the charger connected to a battery having an 8-hour Amp-Hour rating of at least 4 times the full load current rating of the charger. Other connected loads such as DC-to-DC power supplies or inverters, may put ripple on the battery appreciably above 30 mV.

Unfiltered chargers should not be used with critical loads such as communication systems, amplifiers and instrumentation systems, but should only be used for non-critical applications such as engine cranking.

This charger can be used on any number of lead-acid, nickel-cadmium, or nickel-iron cells as long as the desired float and/or equalize voltages are within the range of the charger.

## 3. INSTALLATION

a. Location: Select a clean, dry location for the charger. It may be located in the battery room, but not over the battery, and must be mounted upright. The openings for ventilation in the top, bottom and sides of the cabinet should not be obstructed, as they provide convection cooling and ventilation. Ambient temperatures between 32° F and 122° F, and elevations up to 3,300 feet above sea level, will not affect the performance of the charger. Operation at higher temperatures, or at higher elevations, is possible if the ampere output is de-rated in accordance with published information, and if the charger is custom ordered for these operating ambient conditions.

b. Wire Sizes AC: Wire sizes for the AC wiring may be selected by consulting the data on the nameplate for input amperage. Local electrical or NEMA standards should dictate appropriate wire size. Most codes specify that the AC wiring size must match the current rating of the input circuit breaker or fuses.

c. Wire Sizes DC: The size of the charger leads should be selected to (a) carry the charger (ampere) current rating, and also (b) provide less than 0.5 volt total drop at rated current in the loop or leads between the charger and battery terminals. Choose the larger wire size that meets conditions (a) and (b). Do not undersize. It is good practice to keep the DC leads as short as possible and to keep them together as a pair to obtain low inductance. Likewise, it is good practice to avoid sharp bends and to run both DC leads together if run in conduit.

d. Input Power: These chargers are nominal 120V, 208V, 220V, 240V (50/60 HZ) or 480V (60 Hz) AC single phase. If the AC input data as supplied with the charger does not agree with the AC supply voltage at the installation site, do not connect the charger to the AC line. The AC voltage must be within +/- 10% of the rated input voltage of the charger. If not, consult your power company or the battery charger manufacturer.

## 4. PLACING CHARGER IN SERVICE

a. With the AC and DC breakers OFF and the system in float mode, install the charger making AC and DC connections, as described in Section II, 3, and in accord with local regulations as they apply.

b. After connecting the lead from the positive (+) battery terminal to the positive (+) terminal on the charger and the lead from the negative (-) battery terminal to the (-) terminal on the charger, observe the voltmeter. It should read the correct polarity and be approximately the battery open circuit voltage (this is 2.0 volts per cell for lead-acid batteries and 1.2 volts per cell for nickel cadmium batteries). For example, a 60-cell lead-acid battery should read about 2 x 60 cells = 120 volts. This is a check that all cells are in a true series (none connected in reverse) and all connections are tight. The open circuit voltage should be about 8 to 10% below the rated float voltage.

c. The charger can now be energized, by first closing the DC breaker to supply voltage for the control circuits then closing the AC breaker. Set the charger to "float". The AC power ON pilot light should light, and the ammeter should indicate charger output current. It is to be expected that the meter may show up to 110% current rating of the charger; the 110% being the factory setting of the current limit control.

d. The factory preset float voltage adjustment is shown on page ii and when this value is reached, the charger ammeter should show a slow decrease in current, eventually down to a stabilized value. Please note that whenever a charger is in a current limit condition, the output voltage is automatically reduced to a value below the set float or equalize voltage. The voltage will not increase to normal value until the battery's state of charge increases, causing the charger current to decrease to a value equal to or less than the rated current.

e. The factory adjustment of the equalizing charge voltage is also shown on page ii and assuming this is as desired, the Float/Equalize switch may be switched to "Equalize", to check the charger performance at this voltage value. If a manual Equalize Timer (option) has been included, turn it clockwise to activate the equalize charger mode. The charger ammeter may again go up to current limit until the equalizing charger voltage is reached. The length of time required to reach this level depends on the state of charge of the battery, and the ampere rating of the charger versus the battery rating.

f. With the charger operating at the desired float and equalizing voltage values, the system can be considered installed and ready for service.

## 5. ADJUSTMENTS OF FLOAT & EQUALIZING CHARGE (also see Section IV, 1)

a. Each adjustment is made by means of a potentiometer with a slotted shaft for a screwdriver. The potentiometers are front-panel mounted and appropriately marked. A lock nut on each potentiometer is provided and should be tightened after the proper adjustment is completed. This prevents any accidental mis-adjustments of the settings. The voltage response may be slow if a rise in voltage adjustment is desired, because the battery state of charger and connected load must be considered. Turning the shaft clockwise will raise the voltage, and turning counter-clockwise will lower the voltage.

b. Since accuracy of measurement is important when setting float and equalizing voltages, a precision portable VoltOhmmeter with at least 1% accuracy is recommended for these DC measurements. A conventional VoltOhmmeter or analyzer such as the Simpson Model 260 is also satisfactory, but is not as accurate.

c. Any setting of the float voltage or equalizing charger voltage should not be considered final until the ammeter shows less than charger rated current, and voltage does not change after several hours of operation.

## 6. MANUAL EQUALIZE TIMER (OPTIONAL)

a. This timer is provided to obtain a charge up to 72 hours, at a slightly higher value than the ordinary float voltage. The timer may be used for recharging older batteries, or for a freshening charge on new batteries. For a detailed explanation of operation see Section V (Customer Options).

## 7. MAINTENANCE

a. This charger is designed to require a minimum of maintenance. There are no rotating parts except in the optional timer and all components have a nominally indefinite life with no expected aging effect. It should be kept clean, dry and checked periodically to make sure all connections are tight. If necessary, dry air may be used to blow dust out of the interior. In the event of any irregular operation, examine, and tighten if necessary, all internal and external connections and check circuits for continuity (see schematic diagram on page 28). If the difficulty cannot be remedied, contact the manufacturer.

## 8. NORMAL PERFORMANCE

a. Assuming that the charger has been operating in the float position, an indication of normal performance can be obtained by setting the FLOAT/EQUALIZE switch in the equalize position (turn timer off zero). Increased charge current will show on charger ammeter until the battery reaches the equalize voltage. At this point the current should slowly decrease.

b. If the charger has been operating in the equalize voltage position, turn SW1 to FLOAT (turn the timer manually to zero). The charger will indicate zero or little output current until the float voltage is reached. At this point, the current should increase slowly to the system load value, (the battery is now “floating” across the line with approximately equal input and output currents).

c. When operating normally, the current limit control will limit the maximum charger output current to approximately 110% of the rated charge current. In case of a high DC current demand, the current limit control will keep the charger output within safe values without tripping the DC circuit breaker or the AC breaker.

## 9. DESCRIPTION OF OPERATION

There are four major sections of the SCR single-phase charger, which work together to produce stable, regulated, filtered output. The functions of these four sections may be described as follows.

**a. The Power Transformer (T1)**: This section includes T1 and its associated input protection. Its purpose is basically to supply an AC voltage of the proper magnitude and capacity to the rectifier section. It also supplies various other voltages used by the control unit and accessories. It is connected to an AC source by means of a circuit breaker.

**b. The Rectifier Section**: This section consists mainly of the voltage regulating silicon controlled rectifiers and the power rectifier diodes. It accepts the AC voltage from the transformer, rectifies this voltage to DC, and controls the voltage's magnitude so that the charger output is regulated at all times. The firing angle of the SCRs is controlled by the action of the control module. Both the SCRs and the diodes are protected from AC and DC surge voltages by means of the metal-oxide varistor surge suppressors.

**c. The Control Module**: This printed circuit board generates the single-phase phase-fired gate signals that turn on the SCR diodes in response to the charging requirements of the battery load. The output voltage of the charger is monitored by the voltage feedback circuit and advances or retards the phase angle of the trigger pulses so that the output voltage is maintained essentially constant. This is accomplished by comparing a small portion of the output voltage to a stable voltage reference. An error signal is created proportional to the differential voltage. This error signal is then used to alter the phase angle of the SCR gate trigger pulses in order to correct the output voltage. The load current is also monitored by the circuit so that when its value exceeds an arbitrary value (110% rated current) the system is "phased back" to limit the output current to no more than 110% of its rated value.

**d. The Filter Section**:

(1). Depending on the application, the charger may be unfiltered. In this case, one filter choke, L1, is utilized not for filtering but for phase correction of the highly leading current-voltage condition created by the batteries during the charging pulses. The batteries represent a very large capacitor in shunt with a resistive load. This creates out-of-phase current problems for the SCR diodes causing non-uniform triggering problems particularly at low load currents. The single filter choke corrects this condition and also aids the ratio of average current to RMS current flowing in the circuit.

(2). For filtered units, the objective is to remove the charging ripple at the battery terminals. To accomplish this a "T" or "double-L" section filter consisting of inductors L1 and L2 and capacitors C1 and C2 are used. C1 and C2 may consist of one or more individual capacitors. The degree of filtering required dictates whether the "T" or "double-L" configuration is used. The "double-L" section filter is normally used to reduce the ripple to 0.06% of nominal output voltage when the charger is operated as a filtered eliminator.

# SECTION III
# TROUBLESHOOTING

## 1. CAUTION NOTICE

Before troubleshooting, always isolate and de-energize the charger by opening the AC circuit breaker (CB1) and the DC circuit breaker (CB2). This avoids the possibility of high short circuit current damaging the charger, tools, test equipment, or injuring personnel. **NOTE**: Circuit breaker terminals (CBx), printed circuit boards (Ax) and terminals/terminal blocks (TB1, TB2, TB3, TB5 & TB15) have dangerous voltage across them, even when both circuit breakers are open. After isolating the charger, check that the voltage across the filter capacitors (C1/C2) is zero. Once charged, they will take several minutes to discharge if bleeder resistor (R1) is open. If DC circuit breaker (CB2) is not provided, remove the DC fuses (F1/F2) in order to isolate the charger from the battery. AFTER LOCATING THE CHARGER PROBLEM, **ALWAYS** DE-ENERGIZE ALL AC AND DC CHARGER INPUTS AT THE POWER SOURCE BEFORE SERVICING.

## 2. TROUBLESHOOTING PROCEDURE

a. When a charger is not operating properly, the cause must be determined by checking various components until the fault is located.

b. The major components are not checked in the order as listed in Section II, 9, since a charger may exhibit a number of difficulties, each with different symptoms. In many cases, failure of one component may cause another component or part to fail. Therefore, the following paragraphs treat major components, functional circuits and parts individually (or by symptom). Together with serviceability measurements and tests, the faulty part or component should be located.

c. Most of the following checks can be performed with an oscilloscope, a VoltOhmmeter (similar to a Simpson Model 260) and an SCR tester.

d. Consult the trouble-shooting chart in Table A on page 27. When using the table, first locate the fault symptom observed (in the left hand column) then follow the sequence for checking components in the numerical order listed (1, 2, 3 etc.) for that particular symptom. Follow this sequence until the trouble is located. After correcting the trouble, check the charger for normal performance as described in Section II, 8.

e. In addition to those symptoms listed in Table A, the following procedure should be followed for any condition:

- Check voltage of the AC supply to insure that it is within 10% of the value of the specified input voltage.
- Examine charger for any evident loose or improper connections, particularly at the control unit, transformer (T1), input and output terminal board.
- Check continuity of battery circuit by comparing voltage at charger terminals with total of cell voltages.
- Check accuracy of voltmeter and ammeter on the charger.

## 3. TESTING OF COMPONENTS

**a. External Circuit Wiring**

1. When no line voltage exists between TB1-L1 and TB1-L2, check the AC line back to source.

2. With no output, or a low output, the external DC wiring may be at fault. Check the wiring between charger and battery to see that it is properly installed. Make certain that terminals are tight and clean, and that the DC wiring is free from grounds. The total operating voltage drop in the loop or leads between the charger and battery terminals should never exceed 0.5 volt (at rated charge current), and preferably should be kept considerably below this limit by using a sufficiently large wire size.

**b. Power Transformer (T1)**

1. With the AC and DC circuit breakers open or "OFF", open the cabinet and carefully check the line voltage across the line terminals (TB1-L1 and TB1-L2). Refer to Section III, 2, a, 1 on page 6 if no AC voltage is indicated. Check the wiring connections to ascertain that unit has the proper primary tap connections for the line voltage indicated. Turn on the AC circuit breaker (CB1). Check that the voltage at the primary is the same as that of the line. If not, CB1 or the wiring between it and T1 is open. In this case proceed with checks under Section III, 2, c, 1 below.

2. Using an AC voltmeter, check AC secondary voltage on the main transformer (T1). See Table B below for expected voltage values. If secondary voltages are much less than indicated, then either T1 is at fault or the power regulating devices (SCR1 or SCR2) are faulty.

**TABLE B - SECONDARY VOLTAGE OF TRANSFORMER T1**

| Expected Voltages (AC) | Leads or Locations |
|---|---|
| Approximately 2 times float voltage | X1 to X5 |
| 120 Vac | Y1 to Y2 |

NOTE: The "X" of Table B voltages should be measured as they terminate on the full-wave bridge components. Where power rectifier fuses are employed in the larger power chargers (see custom diagrams and parts list), these fuses should also be checked, and replaced if unserviceable.

**c. Circuit Breakers (CB1/CB2)**

1. AC Circuit Breaker (CB1): When an AC voltmeter of suitable range is connected between leads L1-L2 and indicates line voltage, but does not indicate when connected to the output terminals of CB1 when closed, the circuit breaker is probably defective. Deenergize the AC supply to the charger and remove the leads to the circuit breaker. Use a voltohmmeter to check for continuity between the circuit breaker terminals with breaker manually closed. Zero resistance should be indicated if the unit is operative. If unit checks OK, check performance by measuring the AC voltage drop across each pole of the breaker. This voltage should be under 0.1 volt when the load current is normal. If a higher voltage drop is found, replace the breaker.

2. DC Circuit Breaker (CB2): When the DC circuit breaker is suspected of being inoperative or at fault, a similar test to that made for the AC breaker will determine the operating condition of the breaker.

3. If the polarity protection diode (CR1) is shorted, the battery will discharge into CR1, which will trip the DC circuit breaker (CB2). Check CR1 with an ohmmeter (both polarities) for a shorted condition and replace if required.

**d. Surge Suppressors (SS1/SS2)**

1. The metal-oxide varistor (MOV) type of surge suppressor is used throughout these battery chargers instead of the older selenium type. This is because of personnel safety. When a selenium device fails and arcs or burns, very toxic selenium fumes are given off which are very poisonous, if inhaled. The MOV-type has a much sharper limiting “knee” characteristic and performs a better protection function. If an MOV surge suppressor fails during a high-energy transient, it may explode. This is an obvious failure and the part must be replaced.

2. If the suppressor is shorted, an ohmmeter check will indicate continuity. When the suppressor shows an infinite resistance in both directions measured with it disconnected from the charger and has a normal appearance it can be presumed to be in good operating condition.

**e. Rectifier Diodes (SCR1/SCR2)** - (also see Section III, 2, f)

1. These diodes are a part of an SCR-diode module(s) in which the SCRs and diodes are contained in a module(s) mounted by an electrically insulated heat sink plate. Three connections (plus one SCR gate terminal) are available for checking. The diode portions should be checked by disconnecting one terminal and measuring their forward & reverse resistance, in either of two ways. In using an ohmmeter, use the R x 1 scale for the forward resistance and this should show approximately 5 to 10 Ohms. The reverse resistance should be up in the thousands of ohms (probably 50,000 or more) measured with a higher scale of the meter. The diodes may also be checked by connecting them in series with a 6 or 12 Volt lamp across a DC source of the same voltage. The lamp must require at least one-quarter Ampere. The lamp should light with nearly full brilliance with current flowing in the forward direction and not at all in reverse. If it lights in both directions, the diode is shorted. If in neither direction, the diode is open.

2. Note that semiconductors usually short in pairs in bridge circuits, seldom as single units, and it is rare that all four semiconductors in a bridge are found defective. When diodes fail it usually is because of surge voltages. Therefore, surge suppressors (SS1/SS2) should also be checked to determine that they are operative. Refer to Section III, 2, d on page 7.

**f. SCR Diodes (SCR1/SCR2)** - (also see Section III, 2, e)

1. These devices are part of the SCR-diode module(s) described in Section III, 2, e above. Power regulating devices SCR1 and SCR2 are silicon-controlled rectifiers, which cannot be checked using the same method as used with rectifier diodes by forward and reverse resistance checks, since the SCR will always show a high resistance until triggered.

2. The operation of the SCR can be checked with an oscilloscope. The gate-firing voltage signal is produced by the control module assembly (A1). The oscilloscope should be GROUND ISOLATED for these tests. This is normally done by using a line isolation transformer in which the secondary that powers the oscilloscope is UNGROUNDED. Alternatively a battery powered portable oscilloscope can be used. The gate signal may be checked on the control module (see Section III, 2, g) or where the twisted-pair trigger leads terminate on the SCR-diode module. The same signal should appear at both points. Absence of the signal indicates that the control module is defective, not the SCR.

3. If the charger AC input breaker trips immediately, and a shorted SCR is suspected, a simple check with an ohmmeter can be made. Turn off CB1 and CB2. Connect to the anode and to the cathode and adjust to the direct reading scale of the ohmmeter. If a low resistance is observed, reverse the leads and again check the resistance. If this reading is also low, the SCR is shorted and should be replaced.

4. An SCR can also be checked for operation with a Simpson Model 260 voltohmmeter. With the black lead in common and red lead in (+), put polarity switch to +DC. Connect the red lead to the anode and the black lead to the cathode. The meter should now indicate high resistance above 50,000 Ohms (when on the R x 10,000 scale). With the leads connected as above, set the function switch to R x 1 and touch the gate to the anode. This should fire the SCR and give a reading of approximately 5-20 Ohms. This shows the SCR has been turned on. On very small SCRs this reading will hold after removing the gate lead. This is latched-on and can be unlatched by opening the cathode lead. Larger SCRs will not stay on with the current available with Simpson meter. The Simpson may not have enough current to gate or turn on extremely large SCRs (400 Ampere and up).

5. If the charger output is too high, unplug the control module and turn on the charger. With no gate signals the charger should have zero output. If there is still current output, one or both SCRs are defective.

6. The above checks can be used to confirm that a suspected SCR is indeed bad. However, occasionally an SCR might check OK in all these tests and still break down or fail in the charger circuit during normal operation. Any SCRs suspected should be replaced.

**g. Control Module PC Board Assembly (A1)**

One preliminary note that should be kept in mind: The action of the overall feedback circuit controls the battery charger output voltage so that the feedback voltage from the slider of the "FLOAT ADJUST" potentiometer (R3) to the control module board matches the 6.4 Volt reference voltage on the module. Measure this voltage and if it is not approximately 6.4 Volts the feedback circuit or related circuits are not functioning. Proceed as follows using the GROUND ISOLATED oscilloscope described in Section III, 2, f, 2 on page 8. Make the following tests in the order shown.

1. If the gate signals were not checked as described in Section III, 2, f, 2, do so at this time. If one or more of the gate signals are absent when attempting to operate the charger in a normal manner, make the following checks. Refer to FIGURE 1 on page 29 for component layout and test point locations on the trigger board (A1). See schematic on page 30 for related circuit diagram.

2. Check DC voltages at test points A (+10 volts) and B (-10 volts), referred to board ground, (GND). If either or both voltages are missing, check fuse (F1), transformer (T1), and diodes (CR1-CR4) on the PCB for malfunction. If ok, proceed as follows.

3. The following waveform tests must be made using the oscilloscope set with vertical sensitivity set at 2V/CM and the horizontal time base set at 5MS/CM. Compare the waveforms observed with those shown in FIGURE 2 on page 31 for the various test points indicated.

4. Check waveform at test point C and compare with FIGURE 2. If waveform is improper, check CR12 and CR13. Check amplified inverted waveform at test point D. If it is not present, replace IC2.

5. Check ramp pattern at test point E. If not proper, replace Q1 only with its own type, Motorola MPSA55. Do not substitute.

6. Check the ramp with floating DC reference at test point F. If it is not present, replace IC2.

7. Check the short pulse at point G. If not present, check uni-junction transistor Q3.

8. Check waveform at point H. Note that at both points G and H, there may be multiple pulses instead of only one pulse per 8.33 ms period. This is normal particularly if the unit is calling for maximum output voltage. If no pulse waveform is present replace transistor Q2.

9. Check the battery charger rectified waveform by connecting the oscilloscope across the bleeder resistor, R1, and readjusting the input sensitivity to 20 V/CM. If the unit is turned “half-on”, the waveform will look approximately like the waveform of I of FIGURE 2.

**h. Current Sensing Resistor (SH1)**

1. In light current chargers, the current sensing signal is taken directly across the DC ammeter. In chargers with 50 Amp or higher output current, the sensing resistor is a meter shunt, which also serves as the shunt for the panel ammeter. Use a portable precision digital voltmeter and measure the voltage drop across the current sensing resistor. With a rated current output indicated on the panel ammeter, a nominal voltage drop of approximately 30mV (in proportion to rated current) should be observed. If the voltage drop is higher or lower than the nominal indication, replace the ammeter or shunt and recheck the voltage drop.

**j. DC Voltmeter (M2)**

1. The DC voltmeter is of the 2 percent accuracy type. It is connected across the charger output to the battery and should indicate regardless of whether or not the charger is operating or the DC breaker is ON. If it does not, use a precision voltmeter of the 1% accuracy type connected across the meter terminals. An indication on the test meter will show that the panel meter is open. Check the wiring for an open circuit, or replace meter if circuit wiring is complete.

2. A shorted voltmeter will show no indication. Battery current through a shorted meter will cause a visible indication such as smoke from burning wire insulation. Disconnect the charger from the battery and AC source and replace the meter and damaged wiring.

3. If the meter calibration is in doubt, checking against a precision meter will determine if the panel voltmeter is off calibration more than two percent.

**k. DC Ammeter (M1)**

1. The charger DC ammeter is connected in series between the charger output and battery. If open it will indicate zero, or if shorted, it will also indicate zero. First be certain the connections are tight. If still no indication, turn CB1 and CB2 breakers to OFF, disconnect the charger ammeter (and/or shunt) and substitute a precision ammeter of suitable range. Be certain to make solid connections; clip contacts may not carry sufficient current, or may make poor contact and cause the reading to be inaccurate.

2. A reverse-scale indication of the meter indicates the charger is inoperative or internally shorted, and that the battery is discharging through the rectifier, or that the meter leads have been reversed. Turn CB1 and CB2 to OFF and check wiring and meter connections. Then check meter operation, using a 1-1/2 Volt D-cell as the power source. Momentarily touch the D-cell terminals (with proper polarity) to meter terminals and observe meter deflection.

**m. Filter Capacitors (C1/C2)** - (filtered chargers only)

NOTE: Capacitors C1 and C2 may consist of one or more parallel-connected capacitor units as needed by the filtering requirements. C2 normally is used only in chargers with the filtered eliminator option.

CAUTION: The filter capacitor is on the charger side of the blocking diode (CR2) and is NOT charged by the battery when CB2 is turned ON. When the charger is turned "OFF" (CB1 opened) the capacitor will hold a charge until discharged by bleeder resistor (R1). Capacitors C1 and C2 should always be discharged before servicing in the event the R1 has opened and no longer serves as a bleeder.

1. Before attempting to check the output ripple, it should be determined that in all other respects the charger is operating normally. Having determined this, the ripple may be checked as follows. Connect a sensitive AC voltmeter (digital type preferred) to the battery terminals and measure the AC ripple voltage. If it measures more than 30 milliVolts RMS check the following:

(a). That the battery connected to the output terminals of the charger has an Ampere-hour rating of at least four times the rated capacity in amperes of the charger.

(b). The ripple is measured at the terminals of the battery.

(c). Check capacitors C1 and C2 as follows: Switch the VoltOhmmeter to the Rx100 scale and connect the red lead to the capacitor plus terminal (marked by a red dot or plus sign) and the black lead to the negative terminal. The meter should initially swing up scale toward zero Ohms then come back as the capacitor charges. A reading of zero Ohms indicates a shorted capacitor while no initial swing means an open capacitor. Either an open or shorted capacitor should be replaced.

**n. Internal Wiring**

1. Check internal wiring for obvious mechanical faults or wear. Follow the schematic diagram on page 28 and check continuity with an ohmmeter to determine open connections. Check wiring against ground also, and remove any grounds.

# SECTION IV
# SYSTEM ADJUSTMENTS

## 1. VOLTAGE ADJUSTMENTS AND RESPONSE

When abnormal output voltage exists (or no output current is present), and the previous checks in **Table A** on page 27 “VOLTAGE ADJUST INEFFECTIVE” have been made without locating the fault, switch the AC breaker (CB1) to OFF. Switch the DC breaker (CB2) to OFF or disconnect the battery and proceed as follows:

Check the battery with a portable voltmeter of one percent accuracy to insure that it is not higher than the rated float voltage. For proper operation, the open circuit voltage of the battery must be slightly lower than the rated float voltage. If the battery voltage is higher than the float voltage range, check the number and type of cells connected to the charger making certain the proper number and type of cells are not exceeded. Close the DC breaker (CB2) or connect charger to battery. Close the AC breaker (CB1). If battery voltage is now within the float voltage range or is slightly lower and some output current exists, proceed with Section IV, 1, a, 2 below.

If the battery voltage is slightly lower or within the float voltage range, switch the charger to the equalize mode. If still no output appears, or the potentiometer (R5) does not produce a rise from the previous value, turn equalize charge control fully clockwise, and if still no voltage rise is obtained or no output appears, proceed again with the check sequence in **Table A** trouble-shooting chart. If the voltage increased or output was obtained when the charger switched, to evaluate proceed with the voltage adjustments.

### a. Float Adjustment

1. Since the charger must be operable for this adjustment, preceding checks in Section IV, 1 above must indicate a serviceable charger. Set switch (SW1) to “FLOAT”. Use a portable voltmeter of one percent accuracy. Connect the battery supply leads to the battery and close the DC (battery) breaker (CB2). Set the AC breaker (CB1) to "ON".

2. Since the EQUALIZE and FLOAT potentiometer control settings interact with each other, it is always necessary to adjust the FLOAT control first and then the EQUALIZE control afterward. Never finalize a voltage adjustment with the charger output in excess of 100% rated output current.

3. Turn the control clockwise, watching the response on the voltmeter. Clockwise rotation should cause the charger output current to increase rapidly, while the voltage should rise slowly. The rate of voltage rise depends upon whether the battery is fully charged, the size of any connected load, and the size of the charger versus the size of the battery. After getting several volts response in battery voltage rise, turn the FLOAT control counterclockwise. This should result in a rapid drop in charger output current and eventually in a slow decrease in battery voltage. Now adjust the voltage for the desired float setting and tighten the locknut on the potentiometer.

**b. Equalize Adjustment**

1. Since the equalize adjustment will not affect the float voltage adjustment and requires a higher voltage it should always be made after the float voltage is determined. Use a portable voltmeter of one percent accuracy as in the float adjustment. Set switch (SW1) to “EQUALIZE”. Close the DC (battery) breaker (CB2). Set the AC breaker (CB1) to "ON".

2. In attempting to set the equalize voltage, one thing must be kept in mind. It will be impossible to set the equalize voltage if the batteries are in a discharged condition. If fact, they must be at near full-charge. This is to prevent the charger from going into a current limit condition. Current limit reduces the charging voltage and no matter if the EQUALIZE potentiometer is increased to a full-clockwise position, the charger voltage will not increase.

3. Therefore, it is suggested that the batteries be placed on equalize charge for several hours so that the charger is no longer in current limit. This should be observed using the portable 1% accuracy voltmeter and the charger panel ammeter. When the charging current falls below the 100% rated value of charger current, observe the voltage and set carefully for the desired equalize voltage. If, upon readjustment, the current again goes into current limit wait for the batteries to continue their charge cycle. Continue this adjustment procedure until the desired voltage is reached and the current is less than rated current. When the final setting is determined, tighten the lock nut on the EQUALIZE potentiometer.

## 2. CURRENT LIMIT RESPONSE AND ADJUSTMENT

**a. Checks and Adjustments**: Make certain the charger leads are connected to the battery and that the panel voltmeter indicates the proper polarity. Switch the DC breaker (CB2) to "ON" and AC breaker (CB1) to "ON". The "AC ON" indicating light (DS1) should illuminate, indicating power has been applied. With the charger in float mode, a float voltage charge should be indicated on the panel voltmeter and the ammeter should show either a charge current, or practically none at all, depending on the state of battery charge.

1. If the batteries are in a discharged condition, switching to the equalize mode will cause the charger to automatically go into a current limit condition. If, however, the batteries are fully charged they probably will not draw current in the current limit range. In order to cause this condition, it will be necessary to connect additional load to the battery charger or battery bank. This can be resistive elements or turning on the normal load of the installation. When current limiting is encountered, observe that the charger voltage will be reduced below its set value by the current limit feedback signal. Observe that as the current limit condition continues, the voltage will slowly increase as the batteries take on a charge. Eventually the current will begin to decrease below the current limit value and continue to decrease to a value less than 100% of rated output current. As the current decreases below 100% of rated output current, the voltage will become constant at the equalize value and remain so.

2. To check the system response, turn the AC breaker (CB1) to "OFF" to simulate line voltage failure. Charging current will return to zero on the instrument panel ammeter (M1), and the voltage should reduce slightly. Place a load on the battery and discharge it heavily for a short period of time until the voltmeter drops to float value or slightly lower. Return the AC breaker (CB1) to "ON" and observe that charge ammeter again reads 110% of charge rate and voltage is less than the equalizing level. If current is greater than, or less than 110% of rated charge, open the cabinet and locate the CURRENT LIMIT potentiometer on the control trigger PC board (A1). Reference the component layout on page 29 and schematic on page 30. The CURRENT LIMIT is labeled **R11** on single-phase control PC boards (GK0058) and **R65** on three-phase control PC boards (GK0048). Adjust this control for 110% charge current. Repeat the AC circuit breaker (CB1) ON-OFF sequence listed above. If charge rate is still 110% rated value for which it was set, close the cabinet. Restore the charger to float mode.

**b. Checks to Make if Malfunctioning**: If all of the above adjustments were attempted and a high current persists, the current limit circuit on the control trigger board or the ammeter or shunt used for current sense may be defective. The interconnecting wiring may also be faulty. Make the following checks to isolate the fault.

1. Turn the current limit control on the control trigger PC Board (A1) to determine if it has any effect on the high output current reading. This control is the potentiometer labeled **R11** on single-phase control PC boards (GK0058) and **R65** on three-phase control PC boards (GK0048). If it does have an effect, make the adjustment for 110% rated current for a current limit setting as described in paragraph IV, 2, a, 2 above.

2. If no effect is noted, **IC1** on the control trigger PC board (A1) may be defective. If so, replace.

3. Check the voltage generated across the ammeter (M1), or ammeter shunt (SH1) to determine that sufficient voltage is available at rated current to activate the current-limit feedback amplifier. See Section III, 2, h. Use a sensitive DC voltmeter and measure the voltage across the ammeter (M1) or ammeter shunt (SH1). Measure the voltage from the "current limit" pin to the "control circuit reference" pin, on the plug (SO1) of the control trigger PC board (A1). These pins are respectively pins #1 and #10 on single-phase control boards (GK0058) and pins #6 and #9 on three-phase control boards (GK0048). If the sense voltage is not present at the control trigger PC board (A1), check the wiring. If the wiring is satisfactory, proceed with the check sequence listed in **Table A** trouble shooting chart on page 27.

# SECTION V
# SCR/SCRF SERIES BATTERY CHARGER CUSTOMER OPTIONS

The following pages describe customer options available in SCR/SCRF Series battery chargers. The text describes the basic operational philosophy and theory of operation. Block diagrams (or schematics) for these options are shown in Section VIII, in numerical order of the "EJ####" specification number.

## 1. GROUND DETECTION CIRCUITS

Purpose: The purpose of a ground detector circuit is to indicate to the user when either the positive (+) or negative (-) output terminal of the battery charger (or its connected load) is grounded. This is important for many applications where a full floating system is required for operation or safety reasons. There are several methods of indicating a grounded output terminal. These will be outlined below with an explanation of how each works.

Descriptions:

### a. POSITIVE / NEGATIVE GROUND INDICATOR LIGHTS (EJ0088)

The simplest form of a ground detection system is the two-lamp method. This utilizes two lamps of voltage equal to the battery charger output voltage connected from the positive terminal to ground and from negative terminal to ground. Under normal conditions, each bulb will have half-voltage applied and glow dimly at quarter-brilliance. Upon a ground, the lamp indicating the grounded terminal will glow at full brilliance. The other lamp will go out.

### b. POSITIVE / NEGATIVE GROUND INDICATOR LIGHTS W/TEST SWITCH (EJ0089)

This is a variation of “EJ0088” above, so that the two lamps are not continuously connected in the circuit. A double-pole, double-throw momentary center off switch (SW12) is utilized. Activating the SW12 down will connect the two lamps in series across the battery, with the center attached to chassis ground. This performs as the two-lamp system (EJ0088) as described above. Activating the SW12 up serves to test the lamps.

### c. GROUND DETECTION SWITCH FOR DC VOLTMETER INDICATION (EJ0094)

This method uses the existing panel DC voltmeter (M2) and two double-throw switches (SW8/SW9) to utilize the voltmeter in both functions. SW8 establishes the meter function (output voltage or ground detection) and SW9 switches the voltmeter between (+) or (-) terminals to chassis ground, reversing the meter polarity to maintain up-scale indications. The voltmeter, used in the ground detection mode, will indicate the DC voltage potential between the corresponding output terminal and chassis ground. For cases of partial grounds, the voltmeter will indicate the difference of the terminal DC voltage and the voltage of the partial ground.

### d. GROUND DETECTION ALARM RELAYS (EJ0086) - W/OPTIONAL INDICATOR LIGHTS

This method utilizes two DC relays which monitor the (+) and (-) terminal voltage to chassis ground and will energize if the opposite polarity terminal is grounded. To insure that the relays will not energize on half-voltage, when there is no ground present, series resistances are used to reduce the relay pull-in sensitivity. However, once pulled in by a ground condition, the relays will not drop out when the ground is removed because the drop out voltage of a DC relay is always less than the pull-in voltage. As a result, a momentary “RESET” switch (SW3) must be activated to open the relays returning them to the “ready” condition. Schematic EJ0086 shows the circuit diagram of this method. The panel lamps shown are a user option that is available for front panel indication. The relay coil voltages, and series resistances will depend on the output voltage of the battery charger.

## 2. AC POWER FAILURE ALARM RELAY (EJ0085) - WITH OPTIONAL INDICATOR LIGHT

Purpose: The purpose of this alarm is to notify the user that the AC input power to the battery charger has been interrupted. A front panel "AC FAILURE" lamp is optional for local indication. Relay contacts are provided for remote monitoring.

Description: The principle of operation utilizes the normally closed contacts of an AC relay (K1). K1 is powered from the AC line at the primary of the transformer (T1). TM1, when energized, holds the normally closed contacts open disabling the alarm indication. When the AC line fails or the AC circuit breaker (CB1) is opened for any reason, the alarm contacts will close activating the alarm indicator. EJ0085 shows the circuit with the optional panel indicator lamp and external relay connections for remote indication. The indicator lamp must operate from the battery power since the AC line power is not available in an alarm state. As a result, the indicator light operating voltage must match the battery DC voltage or must utilize a series-dropping resistor to compensate for the difference in voltage between the battery and indicator lamp.

## 3. AC INPUT VOLTMETER (EJ0095/EJ0121) AND AMMETER (EJ0134/EJ0135) OPTIONS

Purpose: These options are to permit the user to monitor the input AC line voltage and line current to the battery charger. This may be done for either single phase or three phase input power.

Descriptions:

a. Single phase AC: EJ0095 shows the connections to the ac voltmeter and EJ0134 shows the connections to the AC ammeter. The ammeter is usually connected to the AC line via a current transformer (CT1) if the line current is over 50 Amperes.

b. Three Phase AC: EJ0121 shows the connections to the ac voltmeter and EJ0135 and shows the connections to the AC ammeter. Both show the connections utilizing a single meter, one to monitor the three phase-to-phase voltages and one to monitor the three line currents. A two-pole, three position switch (SW5) is used to switch the voltmeter from phase-to-phase to check all three input voltages. The ammeter switch (SW6) is a special switch, which shorts all unused current transformer secondaries. Upon changing switch position, it shorts the current transformer (CT1) secondary in use before transferring the ammeter to a new position. This prevents very high voltage arcs when the secondary is open circuited.

> **CAUTION**: NEVER OPERATE A CURRENT TRANSFORMER WITHOUT A SECONDARY LOAD OR SHORT CIRCUIT ACROSS THE SECONDARY TERMINALS.

## 4. HIGH / LOW DC VOLTAGE ALARM RELAYS (EJ0083) - W/OPTIONAL INDICATOR LIGHTS

Purpose: The HIGH/LOW DC Voltage Alarm (HLVA) provides alarm indication for the DC system in the event of a malfunction of the battery charger, which causes the battery voltage to rise or drop to a dangerous level. Relay contacts and optional front panel lamps provide alarm indications.

Description: The HLVA printed circuit board consists of two independent operational amplifier circuits, one monitoring the battery voltage for a high voltage condition and the other monitoring for a low voltage condition.

The board obtains its operating voltage (12VDC) from the battery terminals and if required, an externally mounted dropping resistor (R57).

There are two potentiometers on the HLVA PC board (A2). Viewed from the component side of the board, the potentiometer near the top-left of the board is the LOW voltage alarm (LVA) threshold adjustment. The right-hand potentiometer at the top of the board is the HIGH voltage alarm (HVA) threshold adjustment.

If it is necessary to adjust the LVA threshold in the field, the user must load the battery bank and allow the battery voltage to drop while decreasing the float voltage adjustment to the desired cut-off potential. The LVA potentiometer is then adjusted so that the LVA relay is activated into the low voltage alarm condition. Note that there is a delay time, up to 30 seconds before the relay operates once the threshold voltage is reached. It will be necessary to raise and lower the battery voltage several times to ascertain that the potentiometer setting is correct.

Similarly the battery bank will have to be charged at a high equalize rate in order to set the HVA threshold. At the equalize rate the charger may go into a current limit condition, depending on the state of charge, and it may be impossible to reach the desired high voltage alarm voltage. If this is the case, it will be necessary to substitute a resistive load bank with paralleled capacitance in place of the batteries. Adjust the output voltage of the charger by using the "EQUALIZE" potentiometer (R5) and then set the HVA potentiometer accordingly.

It will be noticed that there is an operational delay time and a hysteresis zone (dead zone) between the drop out voltage and the pull-in voltage of the alarm circuits. This is natural and desirable to prevent chattering of the relays when the threshold voltage is reached.

The factory preset thresholds for alarm conditions are as follows unless otherwise specified:

LVA 2.00 volts/cell for LEAD ACID
1.14 volts/cell for NICKEL CADMIUM
HVA 2.40 volts/cell for LEAD ACID
1.65 volts/cell for NICKEL CADMIUM

## 5. CHARGER FAILURE ALARM RELAY (EJ0127) - WITH OPTIONAL INDICATOR LIGHT

Purpose: The Charger Failure Alarm provides an alarm indication whenever the charger output current decreases to below 2% of rated current for more than 30 seconds. Alarm contacts are wired to TB3 terminals 19, 20 & 21 and an optional front-panel indicator (DS7) is available.

Description: Charger output current is sensed by means of an auxiliary winding on the main inductor (L1). The CFA PC Board assembly (A3) detects the voltage signal from L1. When the voltage signal indicates that the current has dropped to below 2%, an on-board relay switches to provide the alarm indication. When the output current is restored to a value above 2%, the alarm will be automatically reset.

## 6. BATTERY DISCHARGING ALARM RELAY WITH INDICATOR LIGHT (EJ0120)

Purpose: The Battery Discharging Alarm indicates the condition when the battery is no longer receiving adequate charging current from the charger and has become a source of current for the load. Alarm indication is provided by a front panel lamp (DS10) and relay contacts. Alarm contacts are wired to TB3 terminals 22, 23 & 24.

Description: This is accomplished by monitoring the direction of current flow in a DC meter shunt (SH3) connected in the main battery lead. When this current polarity changes from negative to positive the alarm circuit is activated.

EJ0120 shows the connection diagram of the alarms. An op-amp voltage comparator senses when the input signal from SH3 changes from negative to positive polarity. The op-amp output goes “high” and activates the alarm.

The alarm board derives its power from the battery terminals. If necessary, voltage-dropping resistors are used to properly match the battery voltage.

## 7. EQUALIZE TIMERS

Purpose: Equalize Timers are used to switch the charger into equalize charging mode for a set period of time, when required by the batteries. "FLOAT" and "EQUALIZE" indicating lights mounted on the instrument panel can be included with all timers to indicate the charging mode. There are three basic timers described below. These Equalize Timers replace the standard "FLOAT/EQUALIZE" switch (SW1) featured in the charger mainframe and referenced elsewhere in this manual.

Descriptions:

### a. MANUAL EQUALIZE TIMER (EJ0097), W/LIGHTS (EJ0096), W/LIGHTS & SW (EJ0869)

To operate this 0-72 hour timer, turn the timer control knob (TM1) clockwise to the number of charge hours desired. This will start an AC clock, driving two cams, which operate two contacts. One contact provides AC to the clock motor, the other changes the voltage-sensing network to the higher equalizing voltage. Upon completion of the time period, when the timer control knob reaches "0", the clock motor is stopped and the voltage-sensing network is returned automatically to the float voltage value. Option EJ0096 features the aforementioned manual equalize timer, along with "FLOAT" and "EQUALIZE" indicating lights. Option EJ0896 features the aforementioned manual equalize timer and indicator lights, along with a manual "FLOAT/EQUALIZE" switch.

### b. AC LINE FAILURE AUTO-EQUALIZE TIMER WITH INDICATOR LIGHTS (EJ0131)

The Auto-Equalize timer is designed to automatically provide an equalizing cycle when the ac input has been interrupted longer then 10 seconds. The operation of this equalize timer is as follows. Toggle switch (SW1) to the "AUTO/EQUALIZE" position, and the battery charger in the "FLOAT" mode: When the AC power is interrupted for a period longer than 10 seconds and returns, the battery charger is placed in the "EQUALIZE" charge mode for a pre-selected period of time (0 to 999 hours). The timer, now energized, displays time remaining and completes the equalize charge period. Once the timer reaches "0" the charger will switch to the "FLOAT" mode. The timer will shut its self down and remains ready to repeat the operation for the same number of preset hours. The charger may also be returned to the "FLOAT" mode by pushing the "FLOAT RESET" switch (SW11).

The schematic diagram (EJ0131) shows the circuit details. Relay (TM2) is a 10-second time-delay relay, which latches itself closed 10 seconds after the AC power fails. When the AC power returns, the timer (TM1) operates. As long as TM2 is latched closed, the charger is in "EQUALIZE" mode. When TM1 times out, it opens the latch circuit of TM2 and returns the charger to "FLOAT" mode. The timer clutch then disengages, and the timer (TM1) returns to start position. Placing switch (SW1) in the "EQUALIZE" position overrides the timer function and manually puts the charger into "EQUALIZE" mode. "FLOAT" and "EQUALIZE" indicating lights mounted on the instrument panel are standard, to indicate the charging mode.

### c. PERCENT EQUALIZE TIMER WITH INDICATOR LIGHTS (EJ0084)

The “PERCENT” Equalizing Timer is used for certain types of batteries that required a period of equalizing charge every 72 hours. The timer is an electro-mechanical timer whose dial reads from 0 to 100%, and whose drive motor rotates internal cams once every 72 hours.

If the operator sets the “percent” dial for 10%, for example, the timer will operate the cams such that the EQUALIZE charge contacts will be closed for 7.2 hours (10%) out of the 72 hour continuously cycling rotation period.

There is a manual "FLOAT/AUTO-EQUALIZE" switch (SW4), which interrupts the motor circuit when the batteries are to be left in "FLOAT" charge.

"FLOAT" and "EQUALIZE" indicating lights mounted on the instrument panel are standard, to indicate the charging mode. The timer is used to drive a DP-DT relay (K6). One set of the relay’s contacts control the float/equalize charging while the other set of contacts control the indicating lights.

## 8. COMMON ALARM BUZZER (EJ0123)

Purpose: The Common Alarm Buzzer is a charger mounted audible alarm, which is activated when any of several different alarm circuits goes into an alarm state.

Description: This circuit simply utilizes a set of contacts on each separate alarm relay. All of the contacts are wired in parallel and connect the audible alarm (AU1) to the battery voltage. If any set of contacts closes the alarm sounds. A switch (SW13) is provided to turn off the audible alarm if desired.

## 9. COMMON ALARM RELAY (EJ0141) - WITH OPTIONAL BUZZER

Purpose: The Common Alarm Relay circuit provides an alarm indication via relay contacts and optional buzzer when any one of the alarm circuits being monitored goes into its alarm state.

Description: The individual alarm contacts, that are closed when in the non-alarm condition, are wired in a series loop configuration with the common alarm relay and its DC source. If one of the alarm circuits activates, its relay contact will open and de-energize the common alarm relay providing a common alarm condition. One set of contacts of the common alarm relay is connected to the remote alarm terminal strip (TB3) at terminals 28, 29 & 30. If the optional buzzer (AU1) is required, an additional set of contacts is used to activate it. A switch (SW13) is provided to turn off the optional audible alarm if desired.

## 10. MANUAL FLOAT / EQUALIZE SWITCH WITH INDICATOR LIGHTS (EJ0093)

Purpose: Front panel lights indicate whether the charger is in a FLOAT or EQUALIZE charging mode.

Description: A double-pole, double-throw switch (SW7) is substituted for the normal "FLOAT/EQUALIZE" switch (SW1). The second section of SW7 is wired to provide voltage to the proper instrument panel light to denote the "FLOAT" or "EQUALIZE" position of SW7.

## 11. PARALLEL CHARGER OPERATION WITH 2% FORCED LOAD SHARING (EJ0133)

Installation: Using the interconnection cable supplied with the charger equipment, interconnect charger "A" and charger "B" via the load share signal terminal block (TB4) as shown on EJ0133 on page 42. Also refer to any instructions supplied with the manual for the option. DC load cables to be provided by the user.

Purpose: This option permits connecting two battery chargers in parallel to a common battery bank/load in order to increase the total load capability or to provide redundancy for system reliability.

Description: The principle of operation is based on the ability to sense the current furnished by each charger and to electronically force the two currents to be equal within a small percentage. Each individual charger’s current is sensed by means of the shunt associated with the ammeter. The resultant voltages are differentially amplified by the op-amp on each charger’s “paralleling” printed circuit board (A6). The output of the op-amp in each charger is connected to the Control Module (A1) input. This output is combined with the feedback signal from the front-panel "FLOAT" and "EQUALIZE" potentiometers (R3/R5). The net effect is to adjust each charger so that the current furnished is sensed as being equal. The rectangular potentiometer (R13) on the “paralleling” printed circuit board (A6) can be used to correct for any small inequalities that may exist because of difference in shunts or system parameters.

Once the system is balanced, the two chargers will equally share any changes in the load. If either charger is shut down or becomes inoperative, the other will assume the total load up to the point where its current limit circuit operates. It is possible to operate each charger independently by setting the "LOAD SHARE ON/OFF" switch (SW10) to the "OFF" position.

## 12. ZERO-CENTER DC AMMETER FOR BATTERY/LOAD MONITORING (EJ0138)

Purpose and Description: The zero-center dc ammeter (M7) lies within the negative return lead of the battery. A current-sensing shunt (SH2) is provided when the range is greater than 50 Amperes. M7 indicates the direction and amount of the battery current. Indication on the ammeter is to the right of center when the charger is charging the battery and to the left when the battery is furnishing current to the load (discharging).

## 13. HIGH DC VOLTAGE CHARGER SHUTDOWN ALARM RELAY W/IND. LIGHT (EJ0592)

Purpose: The High DC Voltage Shutdown option functionally disables and locks-out the battery charger whenever the output DC voltage exceeds the preset upper limit of charging voltage. This option is designed to protect the batteries and/or load from an over-charge or over-voltage condition. In the case of parallel, redundant chargers with charger shutdown, this option selectively detects and shuts down the faulty charger/rectifier only. The option provides a front panel indicating light and alarm contacts wired to TB3 terminals 53, 54 & 55.

Description: The high DC voltage detector PC Board assembly (A13) is an HVA alarm module, which closes a circuit on alarm and energizes the shutdown relay (K21). The shutdown relay disconnects the Control Module (A1) from its AC supply thus removing the SCR trigger signals to the rectifier. This disables the charger and output current goes to zero. After shutdown the circuit must be manually reset before restarting the charger. A push-button “CHARGER RESET” momentary switch (SW14) is provided on the front panel for this purpose. The high DC voltage detector circuit has a built-in, several second, time-delay to prevent charger shutdown due to transient voltage surges.

Adjustment for the shutdown circuit is provided by a potentiometer (R4) on the A13 assembly. It can be field adjusted using the same procedure as for the HVA portion of the EJ0083 option on page 14.

The factory-preset thresholds for HDCV charger shutdown are as follows unless otherwise specified:

2.40 volts/cell for LEAD ACID

1.65 volts/cell for NICKEL CADMIUM

The above set points are the same as the High DC Voltage Alarm (HVA). If HVA and High DC Voltage Shutdown options are ordered on the same charger, the shutdown thresholds are set as follows unless otherwise specified:

2.45 volts/cell for LEAD ACID

1.70 volts/cell for NICKEL CADMIUM

## 14. END OF DISCHARGE ALARM RELAY (EJ0143) - WITH OPTIONAL INDICATOR LIGHT

Purpose and Description: The End of Discharge alarm option utilizes a printed circuit board assembly (A8) to provide low-limit threshold voltage, set at the lowest safe voltage to which the batteries may be discharged. Alarm contacts are wired to TB3 terminals 31, 32 & 33. These may be used to operate a system load disconnect circuit by tripping a shunt trip DC load circuit breaker or opening a DC load contactor. An optional "END OF DISCHARGE" front panel indicator lamp (DS12) may also be provided.

The factory-preset thresholds for alarm condition are as follows unless otherwise specified:

1.75 volts/cell for LEAD ACID

1.00 volts/cell for NICKEL CADMIUM

## 15. CURRENT LIMIT ALARM RELAY W/INDICATOR LIGHT (EJ0137)

Purpose: The Current Limit Alarm provides an alarm signal whenever the battery charger output reaches the maximum limit set by the current limit circuit. An indicator lamp (DS24) mounted on the instrument panel also lights when the current limit alarm is activated.

Description: The CLA PC Board assembly (A18) continually monitors the output of the current limit circuit on the charger control module (A1). When the current limit circuit indicates that the charger output is in current limit, the circuitry of A18 closes a relay (K24). This provides an alarm condition at terminals 25, 26 & 27 of TB3. A several second delay is built into A18 so that brief excursions into current limit caused by load changes will not result in an erroneous alarm indication. When the battery charger comes out of current limit, the alarm will be automatically reset.

## 16. CABINET HEATER STRIPS (EJ0145)

Purpose and Description: This option provides a method of maintaining a dry charger interior in high humidity environments. Strip heaters (R68x), placed inside the charger cabinet, are physically shielded to prevent accidental human contact. A customer-supplied 120 Volt single-phase source provides power for this option, and is separate from the charger circuit. This customer power source, protected by circuit breaker (CB6), is connected to terminal block (TB6) located inside the charger enclosure. The cabinet heaters are "ON/OFF" type, and are controlled by a fixed thermostat (TH1). The thermostat opens on a rise to approximately 80° F and resets (re-closes) at approximately 70° F.

## 17. HIGH / LOW AC VOLTAGE ALARM RELAYS WITH INDICATOR LIGHTS (EJ0155)

Purpose: The HLAC Alarm relay provides an indication whenever the AC input voltage deviates beyond preset limits. The factory-set limits are 115% (high alarm) and 85% (low alarm) of the nominal AC input voltage. Indicator lights on the battery charger front panel are provided for each condition.

Description: The HLAC Alarm relay operates similarly to the High-Low DC voltage alarm relay. An AC Detector PC Board assembly (A11B) converts AC voltage to DC voltage. An Alarm PC Board assembly (A11A) measures this filtered signal from A11B. If the measured signal is not within an acceptable range, an alarm condition is provided at terminals 38, 39 & 40 (High ACV) and 41, 42 & 43 (Low ACV) of TB3. Corresponding indicator lamps (DS18/DS17) are lighted on the instrument panel. A11A has a built-in delay to prevent line voltage surges and sags from causing erroneous alarm indications. When the AC line returns to within acceptable limits, the alarm indications will be reset.

## 18. OVER-TEMPERATURE ALARM RELAY (EJ0439) - WITH BUZZER OR INDICATOR LIGHT

Purpose: The Over-Temperature Alarm provides an alarm indication whenever the battery charger internal components become overheated for any reason. This feature is standard on all battery chargers rated over 300 ADC.

Description: A built-in audible alarm (DS19) is furnished, along with alarm contacts at TB3 terminals 47, 48 & 49. A normally open thermostat (TH2) is mounted on one or more of the heat-sensitive components of the charger. If an over-temperature condition occurs, the thermostat closes the circuit to DS19 and the alarm relay (K18). The audible alarm may be turned off with a switch (SW17) mounted inside the charger enclosure. When the internal component temperature returns to an acceptable value, the alarm relay is automatically reset. SW17 should then be returned to the normal position.

## 19. COMBINED ALARM STATUS MONITOR "CASM" PC BOARD ASSEMBLY (EJ0837)

**Note**: Refer to the Drawing (**EJ0837-XX**) on page 49 for additional information.

Purpose: The Combined Alarm-Status Monitor (CASM) provides a comprehensive, cost-effective method to monitor the integrity of the battery charger and the dc bus.

Description: The CASM combines the monitoring and alarm functions of the High-Low AC Voltage Alarm, High-Low DC Voltage Alarm, Ground Detection Relay Alarm, Charger Failure Alarm, and a Common Alarm Relay into one printed circuit board assembly (A24). Each alarm in the CASM PC board operates similarly to the alarms in the equivalent stand-alone option (see previous descriptions).

One or two form-C relay contacts are provided for each alarm function. These contacts (TB15-1 thru 18) have a contact rating of 0.5A, 125 VAC/VDC resistive. Panel indicators (DS26-DS32) are provided for each alarm function except the Common Alarm. In addition, a front-panel push-to-test switch (SW20) checks the front panel indicators. SW20 tests only the CASM indicators. All relays reset automatically when the alarm condition is corrected. All alarm relays have a 15 second time delay, except the Charger Failure Alarm.

You may operate the CASM Charger Failure Alarm in either of two modes:

1) True Charger Failure Alarm: In the True Charger Failure mode, the CASM PC board does not report an alarm when the charger output current is zero, unless the charger actually has failed. The CASM performs a periodic self-test to accomplish this.

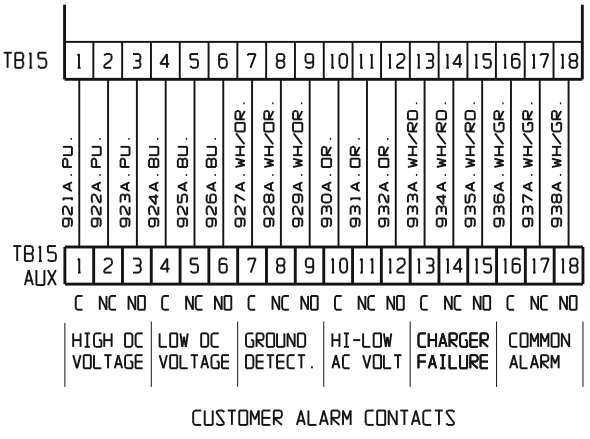
2) Zero Current Alarm: In the Zero Current mode, the CASM reports an alarm whenever the charger output current decreases to zero. In this mode, you may get false alarms if your normal load is very low, or if you have two chargers connected in parallel.

To change the Charger Failure Alarm mode, set the switch (SW1) on A24 to the desired mode. To change the interval of the self-test in True Charger Failure mode, move jumper (J11) on A24 to the desired position (4 minutes or 8.5 minutes).

You can remove the Charger Failure Alarm from the Common Alarm circuit by moving jumper (J6) to pins 2-3. This reduces the incidence of false common alarms, if your system has little or no continuous load current, and you chose the Zero Current mode. This does not affect the operation of the Charger Failure Alarm relay or panel indicator (DS30).

Installation: Remove the mating plug from the alarm terminal block (TB15). Wire remote alarm indicators to contacts 1-18 on TB15 according to drawing EJ0837-XX. If you ordered two form-C contacts, wire both plugs (TB15A & TB15B) according to the drawing. Be sure that your monitor, or other load, does not exceed the relay contact rating on TB15.

Optional Wiring: The standard alarm terminal block (TB15) supplied on the CASM features solder-less plug-in terminals, accepting #18-14 AWG. wire. An optional auxiliary alarm contact terminal block (TB15-AUX) or blocks (TB15A-AUX & TB15B-AUX) may be supplied external to the CASM PC Board assembly (A24). TB15-AUX is supplied if the customer's remote alarm wiring requirements exceed the specifications of the standard terminal block (TB15). Contacts 1-18 on TB15-AUX are wired directly to contacts 1-18 of TB15 on A24. TB15-AUX terminal blocks feature 6-32 binder head screw terminals, and will accept #22-16 AWG. wire.




If you have a grounded battery, disable the Ground Detection Alarm circuit by moving jumper (J7) to pins 1-2, and by removing wire # 836/GR from R107 to “CHASSIS GROUND” (see EJ0837-XX). Putting J7 on pins 2-3 enables the Ground Detection Alarm circuit.

# SECTION VI
# COMPONENT DESCRIPTION

SCR/SCRF SERIES BATTERY CHARGER - SINGLE PHASE MAIN FRAME

| Circuit Symbol (Note 2) | Spare? (Note 1) | Component Description |
|---|---|---|
| A1 | B | Single Phase Input Main Control Module PC Board |
| XA1 | | Holder for Control Module PC Board (A1) |
| SO1 | | Socket for Control Module PC Board (A1) |
| C1 | B | Filter Capacitor (SCRF models only) |
| XC1 | | Filter Capacitor Bracket (SCRF models only) |
| C2 | B | Battery Eliminator Filter Capacitor (SCRF-E models only) |
| XC2 | | Battery Eliminator Filter Capacitor Bracket (SCRF-E models only) |
| C3 | B | Snubber Capacitor |
| C6 | B | EMI Suppression Capacitor |
| CB1 | B | AC Input Circuit Breaker |
| CB2 | B | DC Output Circuit Breaker |
| CR1 | A, B | Polarity Diode |
| CR2 | B | Blocking Diode |
| DS1 | B | "AC ON" Indicator Light |
| F1 | A, B | Main DC Fuse |
| XF1 | | Fuse Holder for F1 |
| F2 | A, B | Redundant DC Fuse<br>(not supplied if dc breaker option is selected) |
| XF2 | | Fuse Holder for F2 |
| L1 | | Main Inductor |
| L2 | | Filter Inductor (SCRF models only) |
| M1 | B | DC Output Ammeter |
| M2 | B | DC Output Voltmeter |
| | | |

| Circuit Symbol (Note 2) | Spare? (Note 2) | Component Description |
|---|---|---|
| R1 | | Bleeder / Feedback Resistor |
| R2 | | Voltage Divider Resistor |
| R3 | B | Float Adjustment Potentiometer |
| R4 | | Voltage Divider Resistor |
| R5 | B | Equalize Adjustment Potentiometer |
| SCR1 | B | Silicon-Controlled Rectifier / Diode Module |
| SCR2 | B | Silicon-Controlled Rectifier / Diode Module |
| SH1 | | DC Ammeter Shunt<br>(supplied with 50 Adc nominal dc output or greater) |
| SS1 | A, B | DC Output Surge Suppressor |
| SS2 | A, B | AC Input Surge Suppressor |
| SW1 | B | Standard Manual Float/Equalize Switch<br>(not supplied when other equalize option provided) |
| T1 | | Power Isolation Transformer |
| TB1 | | AC Input Terminal Block |
| TB2 | | DC Output Terminal Block |
| TB3 | | Remote Alarm Terminal Block<br>(supplied as-required with alarm relay options) |
| TB5 | | Internal (+/-) Signal Connection Terminal Block |
| TB15x | | Remote Alarm Terminal Block<br>(supplied as-required with EJ0837 CASM option) |
| n/a | | Wire Harness |
| n/a | | Cabinet |
| n/a | | Heat Sink(s) |
| | | |

**NOTES:**

1) "A" indicates recommended start-up spare part
   "B" indicates recommended operating spare part
2) For component placement of circuit symbols, refer to Single Phase SCR/SCRF Series Mainframe Schematic (JE5076-00) on Page 28
3) For mainframe replacement parts, refer to Section IX starting on Page 53

# COMPONENT DESCRIPTION

## SCR/SCRF SERIES BATTERY CHARGER OPTIONS - SINGLE/THREE PHASE

**NOTES:**

1) "B" indicates recommended operating spare part
2) For component placement of circuit symbols, refer to SCR/SCRF Series Option Schematics in Section VIII starting on Page 34
3) For option replacement parts, refer to Section IX starting on Page 57

| Option Number | Ref. Page | Circuit Symbol | Spare? (Note 1) | Component Description |
|---|---|---|---|---|
| EJ0083 | 34 | A2 | B | High/Low DC Voltage Alarm PC Board w/Relays |
| | | SO2 | | Socket for A2 |
| | | DS3 | B | Low Voltage Indicator Light |
| | | DS4 | B | Hi Voltage Indicator Light |
| | | R57 | | Voltage Dropping Resistor |
| | | R75 | | Voltage Dropping Resistor |
| EJ0084 | 34 | TM4 | B | Percent Equalize Timer |
| | | SW4 | | Float/Auto Equalize Switch |
| | | K6 | B | Switching Relay |
| | | DS5 | B | Float Indicator Light |
| | | DS6 | B | Equalize Indicator Light |
| EJ0085 | 35 | K1 | B | AC Failure Alarm Relay |
| | | DS2 | B | AC Failure Indicator Light |
| | | R54 | | Voltage Dropping Resistor |
| EJ0086 | 35 | K2 | B | Positive Ground Detection Alarm Relay |
| | | K3 | B | Negative Ground Detection Alarm Relay |
| | | SW3 | | Reset Switch |
| | | R59 | | Voltage Dropping Resistor |
| | | R60 | | Voltage Dropping Resistor |
| | | R83 | | Voltage Dropping Resistor |
| | | R84 | | Voltage Dropping Resistor |
| | | DS13 | B | Positive Ground Detection Indicator Light |
| | | DS14 | B | Negative Ground Detection. Indicator Light |
| EJ0088 | 36 | DS8 | B | Positive Ground Detection Indicator Light |
| | | DS9 | B | Negative Ground Detection Indicator Light |
| | | R50 | | Voltage Dropping Resistor |
| | | R51 | | Voltage Dropping Resistor |
| EJ0089 | 36 | DS8 | B | Positive Ground Detection Indicator Light |
| | | DS9 | B | Negative Ground Detection Indicator Light |
| | | R50 | | Voltage Dropping Resistor |
| | | R51 | | Voltage Dropping Resistor |
| | | SW12 | | Test Switch |
| EJ0093 | 37 | SW7 | B | Float/Equalize Switch |
| | | DS5 | B | Float Indicator Light |
| | | DS6 | B | Equalize Indicator Light |
| EJ0094 | 37 | SW8 | | Ground Detection/Ouput Switch |
| | | SW9 | | Ground Detection Positive/Negative Switch |
| EJ0095 | 38 | M4 | B | Single Phase AC Voltmeter |

| Option Number | Ref. Page | Circuit Symbol | Spare? (Note 1) | Component Description |
|---|---|---|---|---|
| EJ0096 | 38 | TM3 | B | 0-72 Hour Manual Timer |
| | | DS5 | B | Float Indicator Light |
| | | DS6 | B | Equalize Indicator Light |
| EJ0097 | 39 | TM3 | B | 0-72 Hour Manual Timer |
| EJ0120 | 39 | A5 | B | Battery Discharging Alarm PC Board w/Relay |
| | | SO5 | | Socket for A5 |
| | | SH3 | | DC Current Shunt |
| | | DS10 | B | Battery Discharging Indicator Light |
| | | TB2 | | 3-Position DC Output Terminal Block (+batt/load, -load, -batt) |
| | | R71 | | Voltage Dropping Resistor |
| | | R82 | | Voltage Dropping Resistor |
| EJ0121 | 40 | M4 | B | Three Phase AC Voltmeter |
| | | SW5 | | Phase Selector Switch |
| EJ0123 | 40 | AU1 | | Common Alarm Buzzer |
| | | SW13 | | Buzzer ON/OFF Switch |
| | | R61 | | Voltage Dropping Resistor |
| EJ0127 | 41 | A3 | B | Charger Failure Alarm PC Board w/Relay |
| | | SO3 | | Socket for A3 |
| | | R52 | | Voltage Dropping Resistor |
| | | R85 | | Voltage Dropping Resistor |
| | | DS7 | B | Charger Failure Indicator Light |
| EJ0131 | 41 | K6 | B | AC Failure Relay |
| | | K7 | B | Switching Relay |
| | | TM1 | B | 0-72 Hour Auto Timer |
| | | TM2 | B | Time Delay Relay |
| | | R55 | | Timing Resistor |
| | | R56 | | Voltage Dropping Resistor |
| | | CR52 | | Zener Diode |
| | | SW11 | | Float Reset Switch |
| | | DS5 | B | Float Indicator Light |
| | | DS6 | B | Equalize Indicator Light |
| EJ0133 | 42 | A6 | B | Load Sharing Control PC Board |
| | | TB4 | | Load Sharing Signal Terminal Block |
| | | SW10 | | Load Sharing ON/OFF Switch |
| EJ0134 | 43 | CT1 | | AC Current Transformer |
| | | M3 | B | Single Phase AC Ammeter |
| EJ0135 | 43 | CT1 | | AC Current Transformer (line 1) |
| | | CT2 | | AC Current Transformer (line 2) |
| | | CT3 | | AC Current Transformer (line 3) |
| | | SW6 | | Line Selector Switch |
| | | M3 | B | Three Phase AC Ammeter |
| EJ0137 | 44 | A18 | B | Current Limit Alarm PC Board w/Relay |
| | | SO18 | | Socket for A18 |
| | | K24 | B | Auxiliary Alarm Relay |
| | | DS24 | B | Current Limit Indicator Light |
| | | R77 | | Voltage Dropping Resistor |
| EJ0138 | 45 | M7 | B | DC Zero-Center Ammeter |
| | | SH2 | | DC Current Shunt |
| | | TB2 | | 3-Position DC Output Terminal Block (+batt/load, -load, -batt) |
| EJ0141 (w/o Buzzer) | 45 | K8 | B | Common Alarm Relay |
| | | R63 | | Voltage Dropping Resistor |

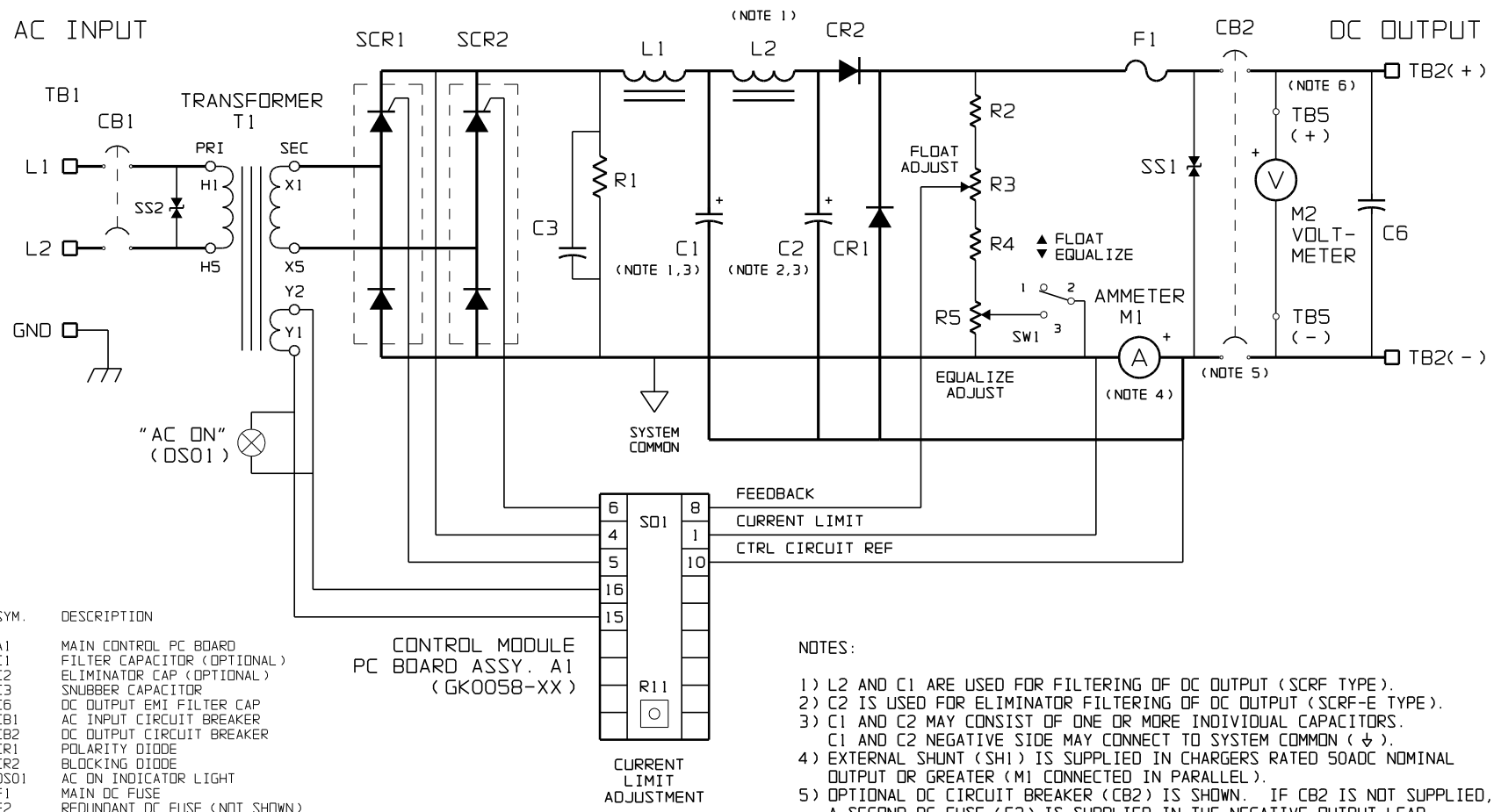
| Option Number | Ref. Page | Circuit Symbol | Spare? (Note 1) | Component Description |
|---|---|---|---|---|
| EJ0141 (w/Buzzer) | 46 | K8 | B | Common Alarm Relay |
| | | AU1 | | Common Alarm Buzzer |
| | | SW13 | | Buzzer ON/OFF Switch |
| | | R61 | | Voltage Dropping Resistor |
| | | R63 | | Voltage Dropping Resistor |
| EJ0143 | 46 | A8 | B | End of Discharge Alarm PC Board w/Relay |
| | | SO8 | | Socket for A8 |
| | | R58 | | Voltage Dropping Resistor |
| | | R76 | | Voltage Dropping Resistor |
| | | DS12 | B | End of Discharge Indicator Light |
| EJ0145 | 47 | CB6 | B | Heater Strip AC Input Circuit Breaker |
| | | TH1 | | Thermostat |
| | | TB6 | | Heater Strip Input Terminal Block |
| | | TB14 | | Interface Terminal Block |
| | | R68x | | Heater Strip(s) |
| EJ0155 | 47 | A11A | B | High-Low AC Voltage Alarm PC Board w/Relays |
| | | A11B | B | AC Detector PC Board |
| | | SO11A | | Socket for A11A |
| | | DS17 | B | Low AC Voltage Indicator Light |
| | | DS18 | B | High AC Voltage Indicator Light |
| | | R78 | | Voltage Dropping Resistor |
| | | R87 | | Voltage Dropping Resistor |
| EJ0439 | 48 | TH2 | | Thermostat |
| | | K18 | B | Over Temperature Alarm Relay |
| | | DS19 | B | Over Temperature Buzzer |
| | | SW17 | | Buzzer ON/OFF Switch |
| EJ0592 | 48 | A13 | B | High DC Voltage Detector PC Board |
| | | SO13 | | Socket for A13 |
| | | K21 | B | Charger Shutdown /Alarm Relay |
| | | DS20 | B | Charger Shutdown Indicator Light |
| | | SW14 | | Charger Reset Switch |
| | | R81 | | Voltage Dropping Resistor |
| EJ0837 | 49 | A24 | B | Combined Alarm Status Monitor (CASM) PC Board |
| | | SO12 | | Socket for A24 |
| | | DS26 | B | High DC Voltage Alarm LED |
| | | DS27 | B | Low DC Voltage Alarm LED |
| | | DS28 | B | High AC Voltage Alarm LED |
| | | DS29 | B | Low AC Voltage Alarm LED |
| | | DS30 | B | Charger Failure Alarm LED |
| | | DS31 | B | Positive Ground Detection LED |
| | | DS32 | B | Negative Ground Detection LED |
| | | R102 | | Voltage Dropping Resistor |
| | | R103 | | Voltage Dropping Resistor |
| | | R105 | | Voltage Dropping Resistor |
| | | R104 | | Voltage Dropping Resistor |
| | | R106 | | Voltage Dropping Resistor |
| | | R107 | | Voltage Dropping Resistor |
| | | SW20 | | Lamp Test Switch |
| | | TB15x | | Remote Alarm Terminal Block(s) |

**NOTES:** 1) "B" indicates recommended operating spare part

| | PILOT LIGHT | AC & LINE TRANSFORMER | AC CIRCUIT BREKAER | DC CIRCUIT BREAKER | DIODES | SCRs | SURGE SUPPRESSORS | PC BOARD REG. VOLTAGE | PC BOARD WAVE FORMS | VOLTAGE ADJUST | CURRENT ADJUST | SHUNT OR AMMETER | FLOAT / EQUALIZE SWITCH OR TIMER | INTERNAL WIRING | EXTERNAL WIRING | DC VOLTMETER | DC AMMETER | FILTER CAPACITOR | FILTER INDUCTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PILOT LIGHT DOES NOT LIGHT | 2 | 3 | 1 | | | | | | | | | | | 4 | 5 | | | | |
| DC BREAKER TRIPPING | | | | 1 | 8 | 9 | 11 | 5 | 6 | 7 | 2 | 4 | | 10 | | | 3 | 12 | 13 |
| AC BREAKER TRIPPING | | 1 | 3 | | 5 | 6 | 11 | 8 | 9 | 10 | 2 | 4 | | 7 | | | | | |
| NO OUTPUT | | 1 | 3 | 4 | 8 | 9 | 10 | 5 | 7 | 6 | | | | 11 | 2 | | 5 | | |
| LOW VOLTAGE OR CURRENT | | 1 | | | | | | 8 | 9 | 3 | 4 | 7 | | | 2 | 5 | 6 | | |
| HIGH OUTPUT CURRENT | | | | | | 6 | | 4 | 5 | | 1 | 3 | | 7 | | | 2 | | |
| VOLTAGE ADJ. INEFFECTIVE | | | | | | 4 | | 1 | 2 | | | | 5 | | 3 | | | | |
| DIODE/SCR FAILURE | | 2 | | | | | 1 | | | | | | | 3 | 4 | | | | |
| DOES NOT EQUALIZE | | | | | | | | | | 2 | | | 1 | 3 | | | | | |
| HIGH OUTPUT RIPPLE | | | | | 5 | 4 | | | 3 | | | | | | | | | 1 | 2 |

# TABLE A
# TROUBLE-SHOOTING CHART

REFER TO SECTION III FOR TROUBLE SHOOTING AND COMPONENT TESTING PROCEDURES




| SYM. | DESCRIPTION |
|---|---|
| A1 | MAIN CONTROL PC BOARD |
| C1 | FILTER CAPACITOR (OPTIONAL) |
| C2 | ELIMINATOR CAP (OPTIONAL) |
| C3 | SNUBBER CAPACITOR |
| C6 | DC OUTPUT EMI FILTER CAP |
| CB1 | AC INPUT CIRCUIT BREAKER |
| CB2 | DC OUTPUT CIRCUIT BREAKER |
| CR1 | POLARITY DIODE |
| CR2 | BLOCKING DIODE |
| DS01 | AC ON INDICATOR LIGHT |
| F1 | MAIN DC FUSE |
| F2 | REDUNDANT DC FUSE (NOT SHOWN) |
| L1 | MAIN INDUCTOR |
| L2 | FILTER INDUCTOR (OPTIONAL) |
| M1 | DC AMMETER |
| M2 | DC VOLTMETER |
| R1 | RATING RESISTOR |
| R2 | VOLTAGE DIVIDER (TOP) |
| R3 | FLOAT POTENTIOMETER |
| R4 | VOLTAGE DIVIDER (LOWER) |
| R5 | EQUALIZE POTENTIOMETER |
| R11 | CURRENT LIMIT ADJUST POT |
| SCR1-2 | SILICON-CONTROLLED RECTIFIERS |
| SH1 | DC SHUNT (NOT SHOWN) |
| SO1 | CTRL PCB (A1) INTERCONNECTOR |
| SS1 | DC OUTPUT SURGE PROTECTOR |
| SS2 | AC INPUT SURGE PROTECTOR |
| SW1 | FLOAT/EQUALIZE SWITCH (OPTIONAL) |
| T1 | POWER TRANSFORMER |
| TB1 | AC INPUT TERMINAL BLOCK |
| TB2 | DC OUTPUT TERMINAL BLOCK |
| TB5 | DC SIGNAL TERMINAL BLOCK |

NOTES:

1) L2 AND C1 ARE USED FOR FILTERING OF DC OUTPUT (SCRF TYPE).
2) C2 IS USED FOR ELIMINATOR FILTERING OF DC OUTPUT (SCRF-E TYPE).
3) C1 AND C2 MAY CONSIST OF ONE OR MORE INDIVIDUAL CAPACITORS. C1 AND C2 NEGATIVE SIDE MAY CONNECT TO SYSTEM COMMON ( ⏚ ).
4) EXTERNAL SHUNT (SH1) IS SUPPLIED IN CHARGERS RATED 50ADC NOMINAL OUTPUT OR GREATER (M1 CONNECTED IN PARALLEL).
5) OPTIONAL DC CIRCUIT BREAKER (CB2) IS SHOWN. IF CB2 IS NOT SUPPLIED, A SECOND DC FUSE (F2) IS SUPPLIED IN THE NEGATIVE OUTPUT LEAD.
6) TB5 IS USED AS AN INTERNAL CONNECTION POINT FOR BATTERY POSITIVE AND NEGATIVE SIGNAL WIRING ONLY.

| REV | ECN No | DATE | APP |
|---|---|---|---|
| 0 | E1384 | 091803 | |

THIRD ANGLE PROJECTION

DRAWN BY MCR 091803

APPROVED

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE SCR/SCRF SERIES BATTERY CHARGER: MAINFRAME SCHEMATIC - SINGLE PHASE INPUT

DRAWING No JE5076-00 REV 0 A

SCALE NTS PART No JE5076-00 SHEET 1 OF 1

FILENAME [JE5076-00.PRT]

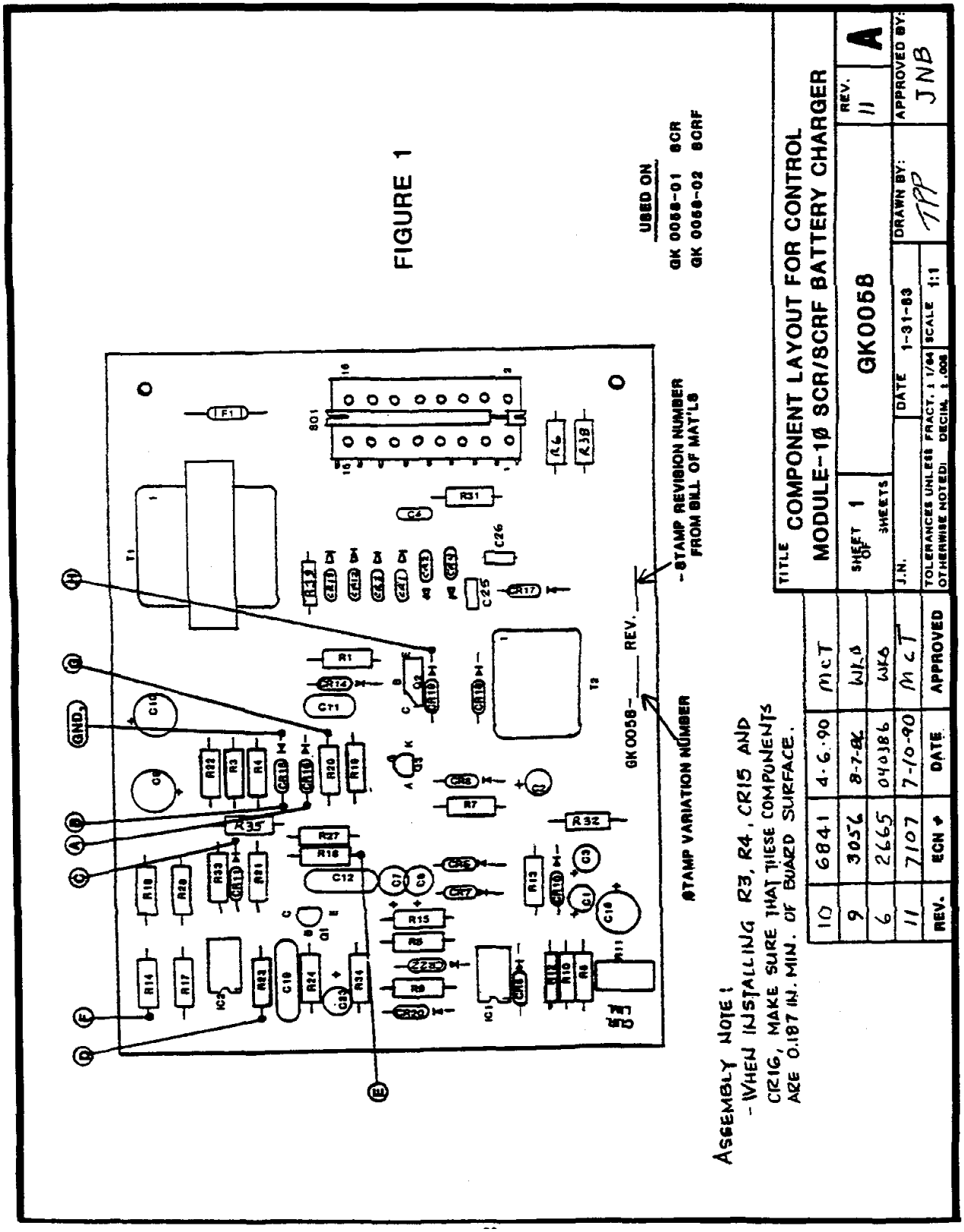


FIGURE 1
USED ON
GK 0058-01 SCR
GK 0058-02 SCRF
TITLE
COMPONENT LAYOUT FOR CONTROL
MODULE-1Ø SCR/SCRF BATTERY CHARGER
GK0058
REV. 11
A
SHEET 1 OF 1 SHEETS
DATE 1-31-03
DRAWN BY: TPP
APPROVED BY: JNB
TOLERANCES UNLESS OTHERWISE NOTED: FRACT. ± 1/64 DECIMAL ± .008
SCALE 1:1
J.N.
REV. | ECN # | DATE | APPROVED
10 | 6841 | 4-6-90 | MCT
9 | 3056 | 8-7-92 | WLS
6 | 2665 | 040386 | WLS
11 | 7107 | 7-10-90 | MCT
@STAMP REVISION NUMBER FROM BILL OF MAT'LS
@STAMP VARIATION NUMBER
GK0058-____ REV. ____
ASSEMBLY NOTE!
-WHEN INSTALLING R3, R4, CR15 AND CR16, MAKE SURE THAT THESE COMPONENTS ARE 0.187 IN. MIN. OF BOARD SURFACE.

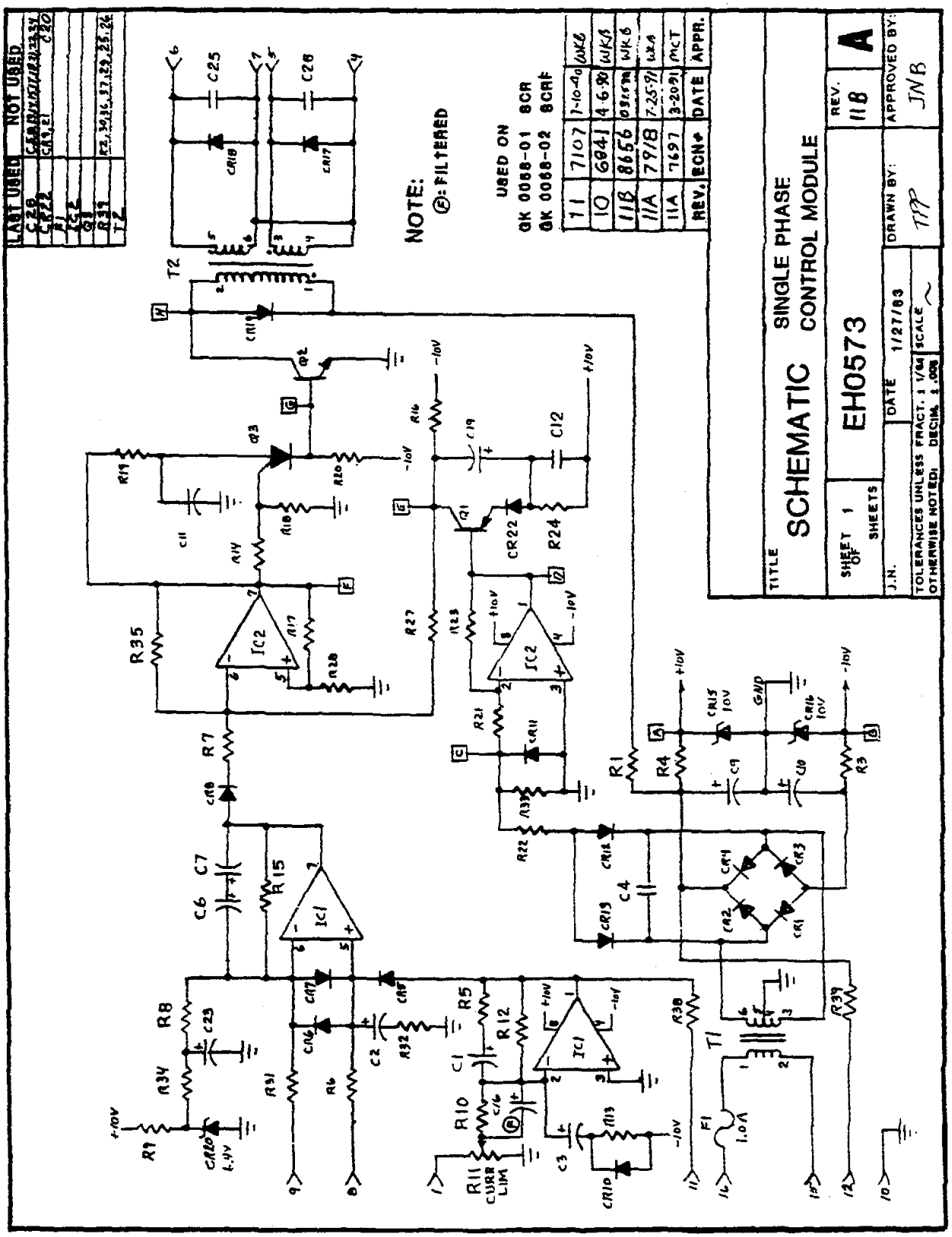
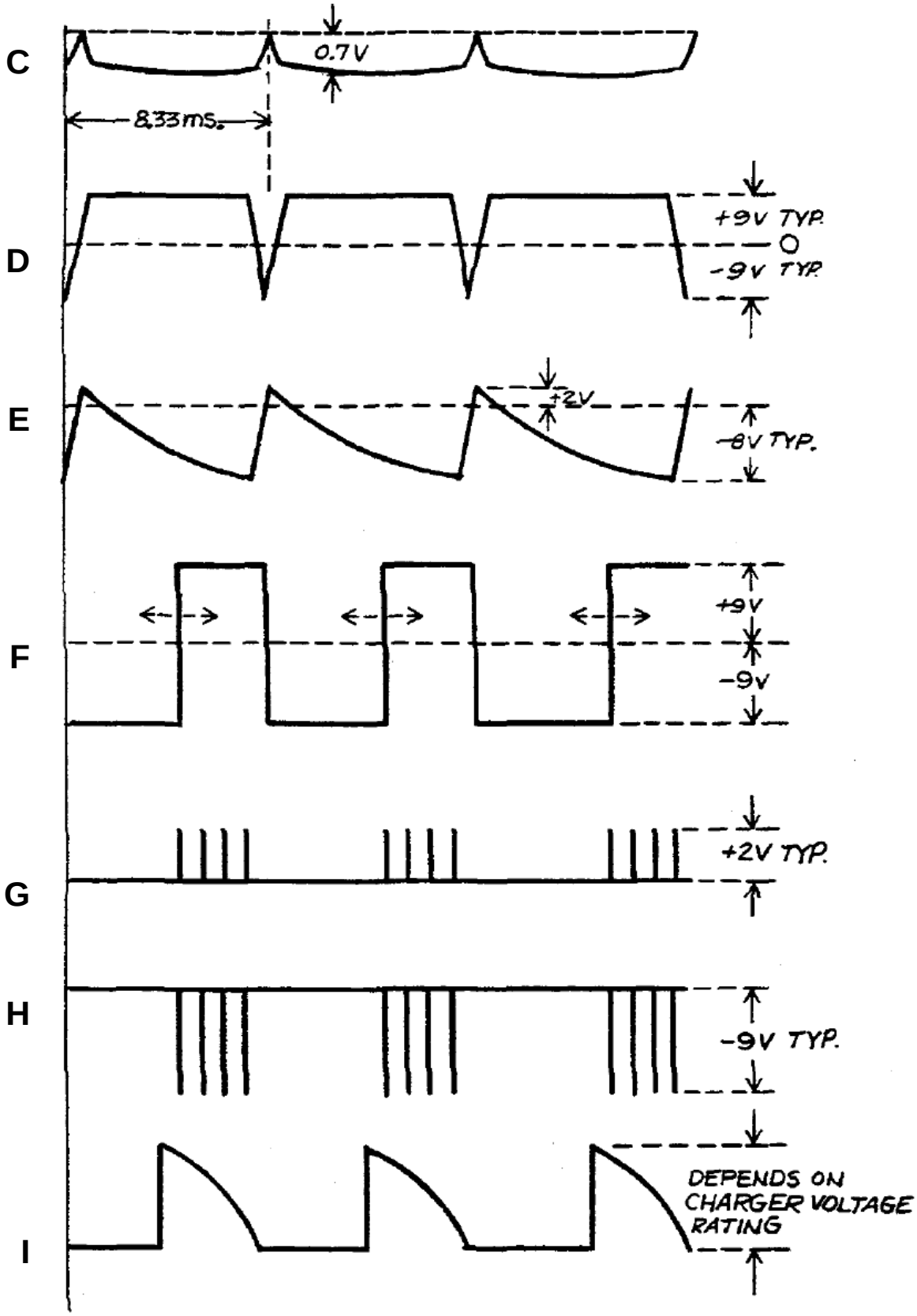

SINGLE PHASE
CONTROL MODULE
SCHEMATIC
EH0573
REV. A
11B
DRAWN BY: TTP
APPROVED BY: JNB
DATE 1/27/93
SCALE
SHEET 1 OF SHEETS
J.N.
TOLERANCES UNLESS FRACT. ± 1/64 DECIM. ± .005 OTHERWISE NOTED:
TITLE
NOTE:
(F): FILTERED
USED ON
GK 0088-01 SCR
GK 0088-02 SCRF
REV. ECN# DATE APPR.
11 7107 1-10-90 WKB
10 6841 4-6-90 WKB
11B 8656 03-27-91 WKB
11A 7918 7-25-91 WKB
11A 7697 3-20-92 MCT
LAST USED NOT USED
C26 C25 C28 C27 C21 C20
CR22 CR21
R1 IC2
Q1
R31 R2, 3, 4, 16, 17, 23, 24, 25, 26
T2
T2
C25
C26
CR18
CR17
CR19
Q2
Q3
Q1
R19
R20
R16
C19
C12
C11
R14
R18
CR22
R24
R35
IC2
R17
R28
R27
R23
IC2
R21
CR11
R22
CR14
R1
R4
CR15 10V
CR16 10V
GND
C9
C10
R3
CR13
C4
CR4
CR3
CR2
CR1
R7
CR8
C6
C7
R15
IC1
CR7
CR6
CR5
R8
C23
R34
R31
R6
C2
R32
R5
C1
R12
IC1
R30
T1
R39
R10
C16
R11
CURR LIM
C3
R13
CR10
F1
1.0A
R1
CR20
6.9V
+10V
-10V

**FIGURE 2** - TYPICAL WAVEFORMS OF
SINGLE-PHASE CONTROL TRIGGER BOARD (**GK0058-XX**)

(See Section III, 3, g)



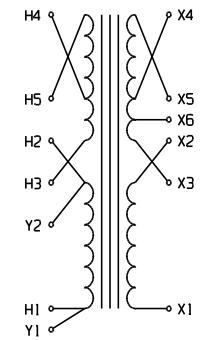



FIG.1 50/60 Hz

PRIMARY CONNECTIONS

| LINE | CHGR VAC | JUMPER |
|---|---|---|
| H1,H5 | 110-130 | H2-H5,H1-H3 |
| H1,H5 | 220 | H2-H4 |
| H1,H5 | 230,240 | H2-H3 |
| H1,H5 | 208 | SEE NOTE 1 |

SECONDARY CONNECTIONS

| OUTPUT | CHGR VDC | JUMPER |
|---|---|---|
| X1,X5 | 24,130 | X2-X5,X1-X3 |
| X1,X5 | 12 | X2-X3 |
| X1,X5 | 48,260 | X2-X6 |

| AUX OUT | OUTPUT VAC | JUMPER |
|---|---|---|
| Y1,Y2 | 120 | NONE |

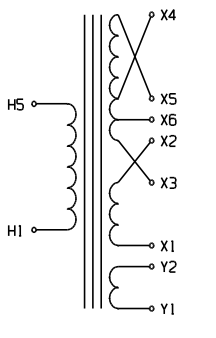



FIG.2 60 Hz

PRIMARY CONNECTIONS

| LINE | CHGR VAC | JUMPER |
|---|---|---|
| H1,H5 | 480 | NONE |

SECONDARY CONNECTIONS

| OUTPUT | CHGR VDC | JUMPER |
|---|---|---|
| X1,X5 | 24,130 | X2-X5,X1-X3 |
| X1,X5 | 12 | X2-X3 |
| X1,X5 | 48,260 | X2-X6 |

| AUX OUT | OUTPUT VAC | JUMPER |
|---|---|---|
| Y1,Y2 | 120 | NONE |

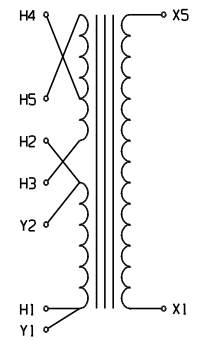



FIG.3 50/60 Hz

PRIMARY CONNECTIONS

| LINE | CHGR VAC | JUMPER |
|---|---|---|
| H1,H5 | 110-130 | H2-H5,H1-H3 |
| H1,H5 | 220 | H2-H4 |
| H1,H5 | 230,240 | H2-H3 |
| H1,H5 | 208 | SEE NOTE 1 |

SECONDARY CONNECTIONS

| OUTPUT | CHGR VDC | JUMPER |
|---|---|---|
| X1,X5 | ANY VDC | NONE |

| AUX OUT | OUTPUT VAC | JUMPER |
|---|---|---|
| Y1,Y2 | 120 | NONE |

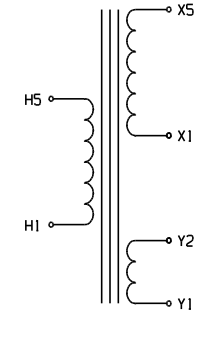



FIG.4 60 Hz

PRIMARY CONNECTIONS

| LINE | CHGR VAC | JUMPER |
|---|---|---|
| H1,H5 | 480 | NONE |

SECONDARY CONNECTIONS

| OUTPUT | CHGR VDC | JUMPER |
|---|---|---|
| X1,X5 | ANY VDC | NONE |

| AUX OUT | OUTPUT VAC | JUMPER |
|---|---|---|
| Y1,Y2 | 120 | NONE |

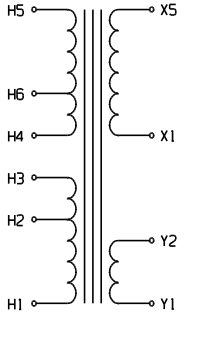



FIG.5 60 Hz

PRIMARY CONNECTIONS

| LINE | CHGR VAC | JUMPER |
|---|---|---|
| H1,H5 | 200-220 | H1-H6,H2-H5 |
| H1,H5 | 230-240 | H1-H4,H3-H5 |
| H1,H5 | 416-440 | H2-H6 |
| H1,H5 | 448 | H2-H4 |
| H1,H5 | 460-480 | H3-H4 |

SECONDARY CONNECTIONS

| OUTPUT | CHGR VDC | JUMPER |
|---|---|---|
| X1,X5 | ANY VDC | NONE |

| AUX OUT | OUTPUT VAC | JUMPER |
|---|---|---|
| Y1,Y2 | 120 | NONE |

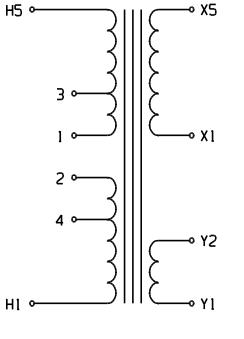



FIG.6 60 Hz

PRIMARY CONNECTIONS

| LINE | CHGR VAC | JUMPER |
|---|---|---|
| H1,H5 | 277 | 3-4 |
| H1,H5 | 315 | 2-3 |
| H1,H5 | 347 | 1-2 |

SECONDARY CONNECTIONS

| OUTPUT | CHGR VDC | JUMPER |
|---|---|---|
| X1,X5 | ANY VDC | NONE |

| AUX OUT | OUTPUT VAC | JUMPER |
|---|---|---|
| Y1,Y2 | 120 | NONE |

NOTES:

1) PRIMARY CONNECTIONS FOR 208V INPUT ARE THE SAME FOR 220V INPUT, THE 208V TAP REPLACES THE 220V TAP.

2) ON ALL TRANSFORMERS
INPUT: H1 THRU H5
OUTPUT: X1 THRU X5

| REV | ECN No | DATE | APP |
|---|---|---|---|
| 5 | E0395 | 112503 | |
| 4 | 6535 | 112989 | n/a |
| 3 | 1737 | 061785 | WKB |
| 2 | 1044 | 101784 | n/a |
| 1 | 175 | 111583 | C.H |

THIRD ANGLE PROJECTION

| | | |
|---|---|---|
| DRAWN BY | PAC | 112989 |
| APPROVED | GRB | 112503 |

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE: TRANSFORMER (T1) SCHEMATICS: SINGLE-PHASE SCR/SCRF BATTERY CHARGER

DRAWING No: EH0552-00 REV: 5 A

SCALE: NTS PART No: EH0552-00 SHEET: 1 OF: 1

FILENAME [EH0552-00.PRT]

## TB3 TERMINAL NUMBERS

| | | |
|---|---|---|
| 1 | C | |
| 2 | NC | HIGH DC VOLTAGE ALARM |
| 3 | NO | |
| 4 | C | |
| 5 | NC | LOW DC VOLTAGE ALARM |
| 6 | NO | |
| 7 | C | |
| 8 | NC | GND DET ALARM POSITIVE (+) |
| 9 | NO | |
| 10 | C | |
| 11 | NC | GND DET ALARM NEGATIVE (-) |
| 12 | NO | |
| 13 | C | |
| 14 | NC | AC POWER FAILURE ALARM |
| 15 | NO | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | C | |
| 20 | NC | CHARGER FAILURE ALARM |
| 21 | NO | |
| 22 | C | |
| 23 | NC | BATTERY DISCHARGING ALARM |
| 24 | NO | |
| 25 | C | |
| 26 | NC | CURRENT LIMIT ALARM |
| 27 | NO | |
| 28 | C | |
| 29 | NC | COMMON ALARM |
| 30 | NO | |
| 31 | C | |
| 32 | NC | END OF DISCHARGE ALARM |
| 33 | NO | |
| 34 | (+) | REMOTE DC VOLTMETER |
| 35 | (-) | |
| 36 | (+) | REMOTE DC AMMETER |
| 37 | (-) | |
| 38 | C | |
| 39 | NC | HIGH AC VOLTAGE ALARM |
| 40 | NO | |
| 41 | C | |
| 42 | NC | LOW AC VOLTAGE ALARM |
| 43 | NO | |
| 44 | C | |
| 45 | NC | EQUALIZE MODE REMOTE INDICATION |
| 46 | NO | |
| 47 | C | |
| 48 | NC | OVER TEMP ALARM |
| 49 | NO | |
| 50 | C | |
| 51 | NC | HIGH AC RIPPLE ALARM |
| 52 | NO | |
| 53 | C | |
| 54 | NC | CHARGER SHUTDOWN ALARM |
| 55 | NO | |

## TB15 TERMINAL NUMBERS

| | | |
|---|---|---|
| 1 | C | |
| 2 | NC | HIGH DC VOLTAGE ALARM |
| 3 | NO | |
| 4 | C | |
| 5 | NC | LOW DC VOLTAGE ALARM |
| 6 | NO | |
| 7 | C | |
| 8 | NC | POSITIVE - NEGATIVE GND DET ALARM |
| 9 | NO | |
| 10 | C | |
| 11 | NC | HIGH - LOW AC VOLTAGE ALARM |
| 12 | NO | |
| 13 | C | |
| 14 | NC | CHARGER FAILURE ALARM |
| 15 | NO | |
| 16 | C | |
| 17 | NC | COMMON ALARM |
| 18 | NO | |

NOTES:

1) TERMINALS LABELED IN NON-ALARM CONDITION.

2) TB15 TERMINAL BLOCK IS USED FOR "COMBINED ALARM-STATUS CHARGER MONITOR" ONLY. ALL OTHER ALARMS ARE TERMINATED ON TB3 TERMINAL BLOCK.

3) WHEN ADDITIONAL SETS OF FORM "C" CONTACTS ARE SUPPLIED, REDUNDANT TB3 OR TB15 TERMINAL BLOCK(S) ARE PROVIDED AS REQUIRED.

| REV | ECN No | DATE | APP |
|---|---|---|---|
| 11 | E1206 | 040903 | |
| 10 | 3469 | 121086 | CH |
| 9 | 1720 | 061785 | WKB |

THIRD ANGLE PROJECTION

DRAWN BY 121086

APPROVED WKB 121086

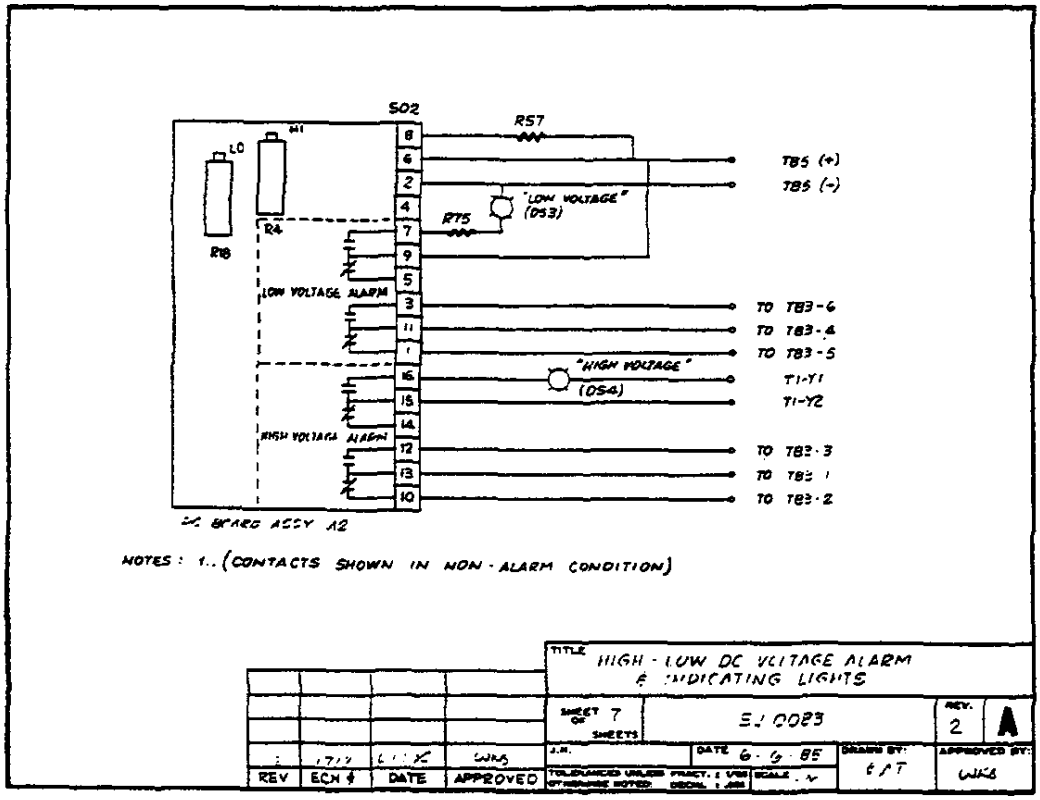
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

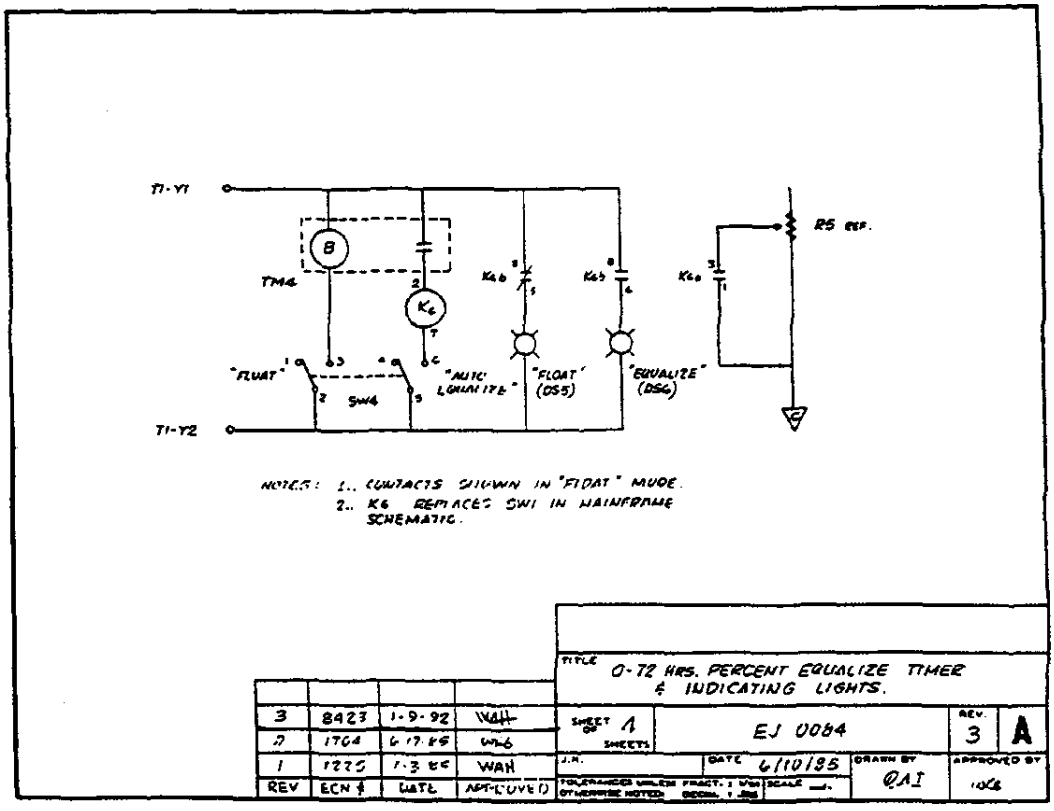
TITLE: REMOTE ALARM TERMINAL BLOCK LEGEND FOR TB3 AND TB15

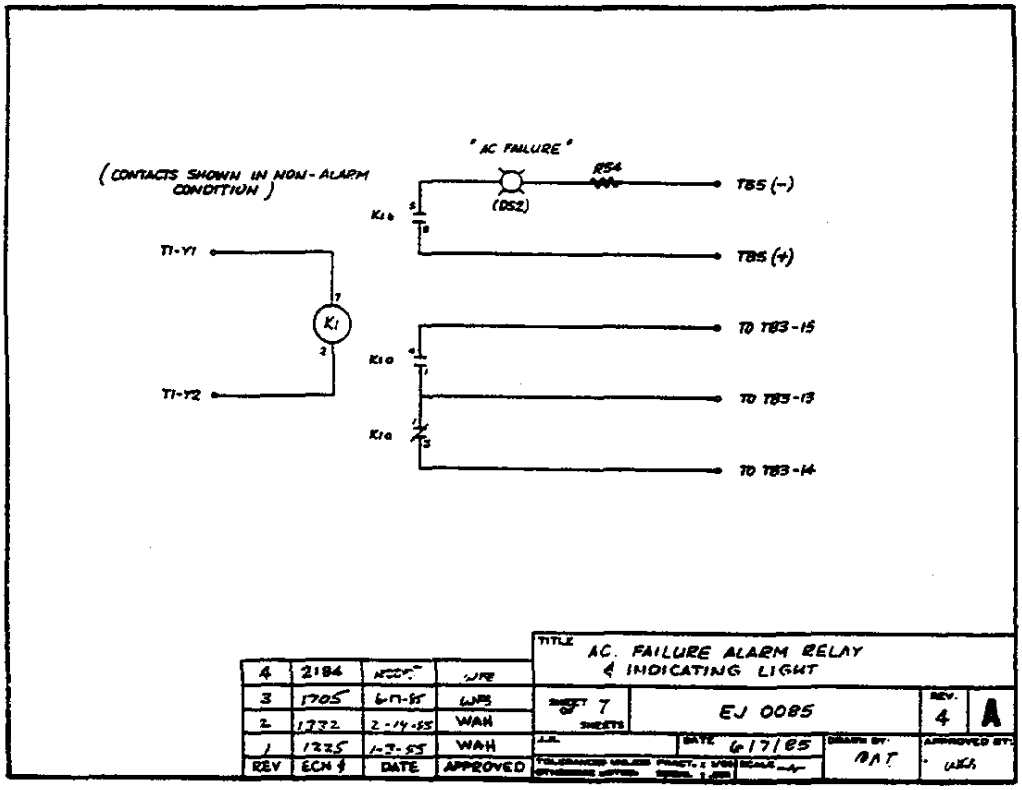
DRAWING No: EH0423-00 REV 11 A

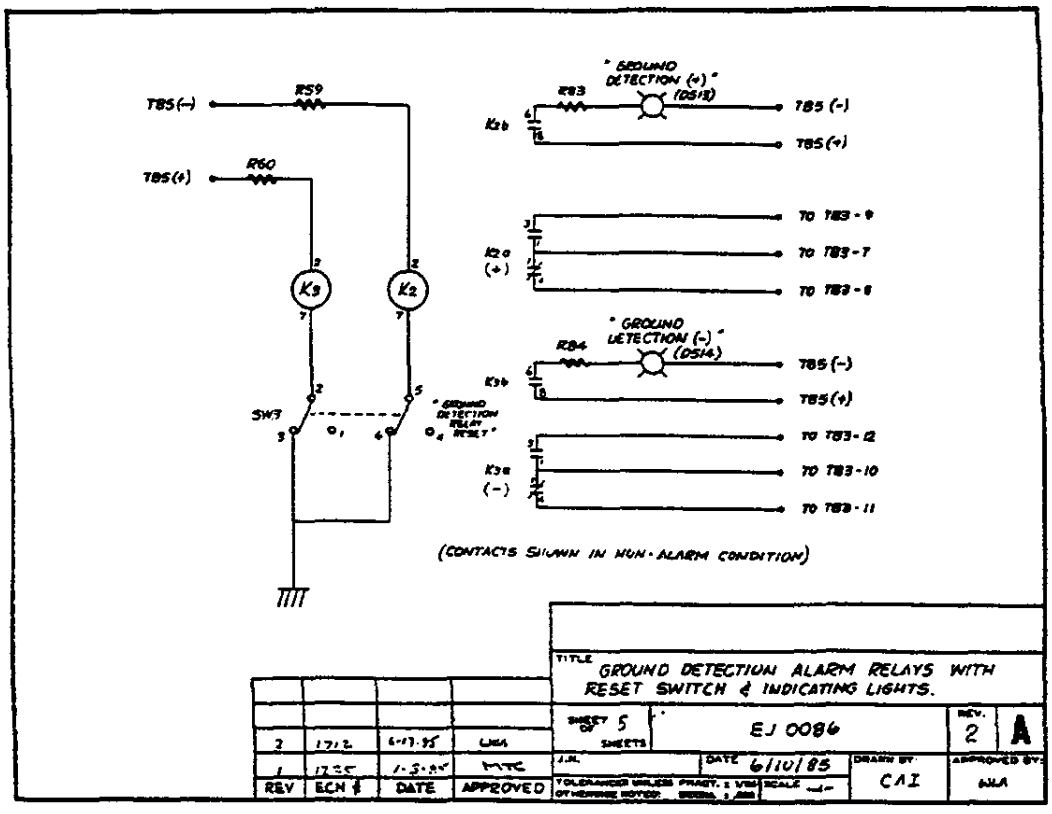
SCALE NTS PART No EH0423-00 SHEET 1 OF 1

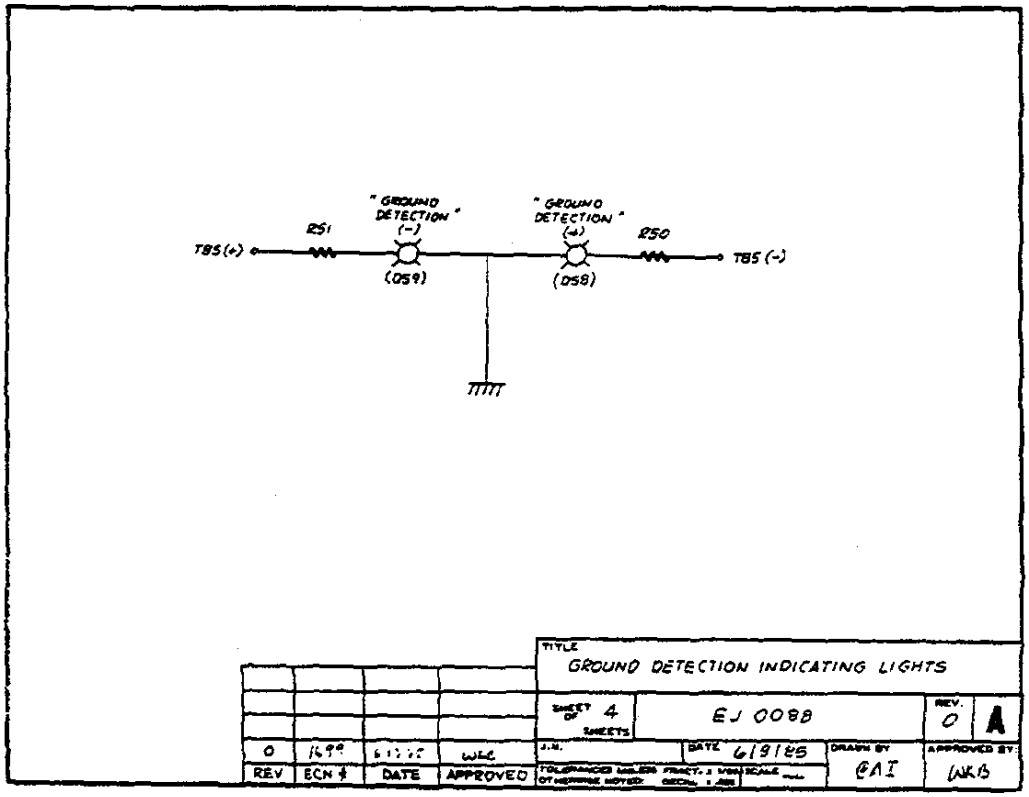
FILENAME [EH0423-00.PRT]

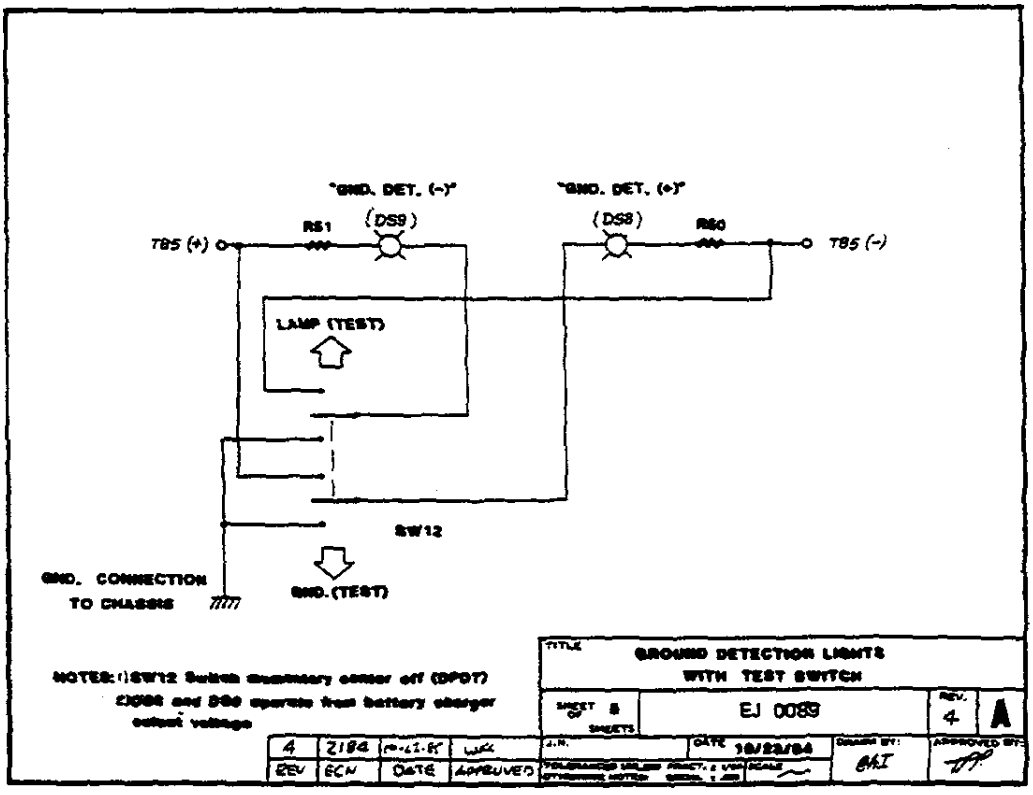

S02
RS7
TB5 (+)
TB5 (-)
"LOW VOLTAGE" (DS3)
RT5
R4
R18
LOW VOLTAGE ALARM
TO TB3-6
TO TB3-4
TO TB3-5
"HIGH VOLTAGE" (DS4)
T1-Y1
T1-Y2
HIGH VOLTAGE ALARM
TO TB2-3
TO TB2-1
TO TB2-2
SPARE ASSY A2
NOTES: 1.. (CONTACTS SHOWN IN NON-ALARM CONDITION)
TITLE
HIGH - LOW DC VOLTAGE ALARM & INDICATING LIGHTS
SHEET OF 7 SHEETS
EJ 0083
REV. 2 A
DATE 6-9-85
DRAWN BY: EAT
APPROVED BY: WAS
REV ECN # DATE APPROVED

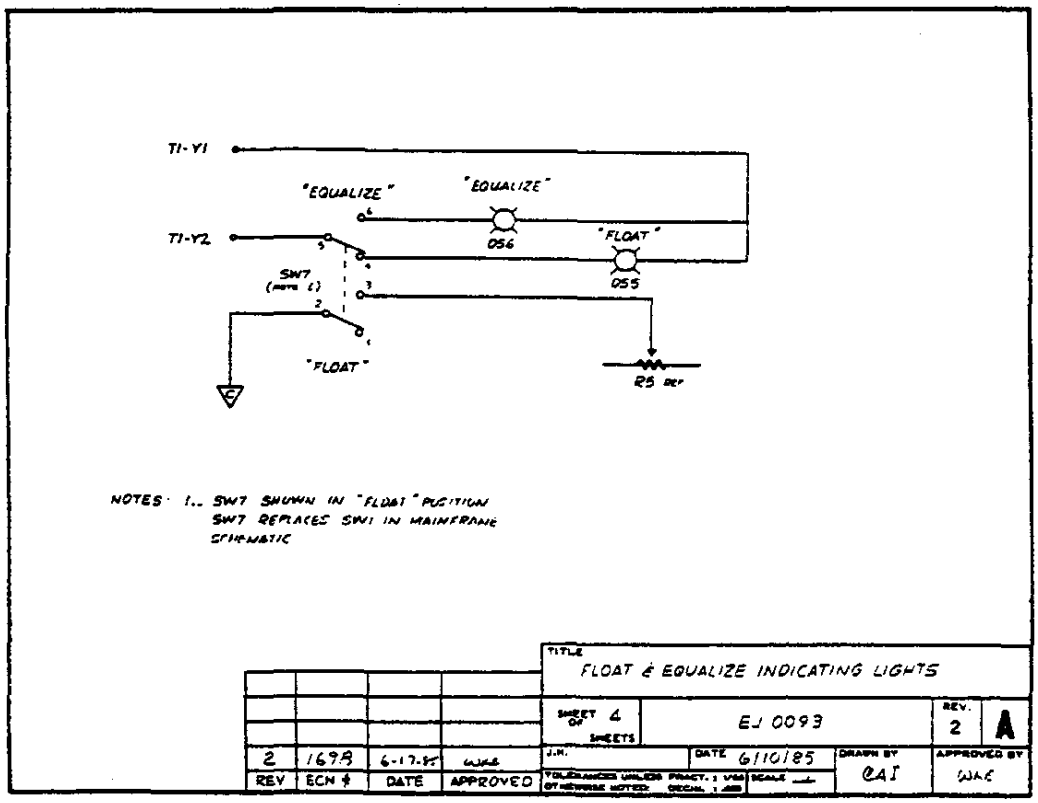

T1-Y1
T1-Y2
TM4
K4
K4a
K4b
K4a
RS REF.
"FLOAT"
SW4
"AUTO EQUALIZE"
"FLOAT" (DS5)
"EQUALIZE" (DS6)
NOTES: 1.. CONTACTS SHOWN IN "FLOAT" MODE.
2.. K6 REPLACES SW1 IN MAINFRAME SCHEMATIC.
TITLE
0-72 HRS. PERCENT EQUALIZE TIMER & INDICATING LIGHTS.
SHEET OF 1 SHEETS
EJ 0084
REV. 3 A
DATE 6/10/85
DRAWN BY QAI
APPROVED BY
3 8423 1-9-92 WAH
2 1704 6-17-85 WAS
1 1275 1-3-85 WAH
REV ECN # DATE APPROVED

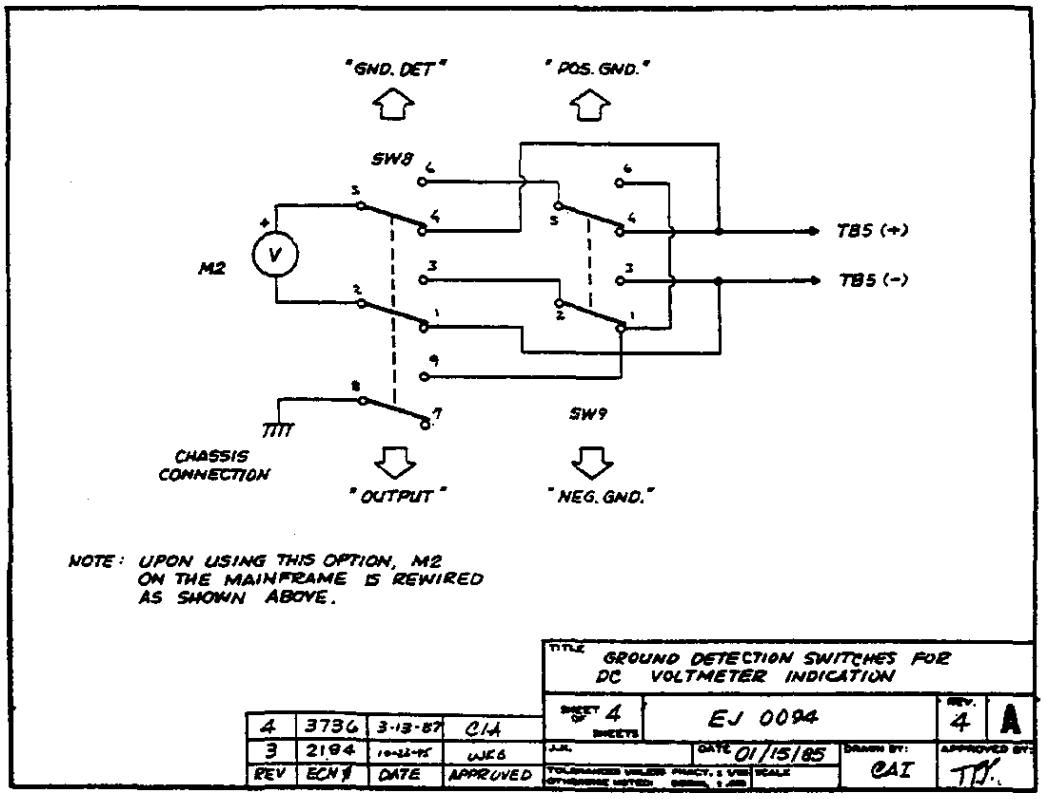

" AC FAILURE "
(CONTACTS SHOWN IN NON-ALARM CONDITION)
R54
(DS2)
K1b
T85 (-)
T85 (+)
T1-Y1
T1-Y2
K1
K1a
K1c
TO TB3-15
TO TB3-13
TO TB3-14
TITLE
AC. FAILURE ALARM RELAY & INDICATING LIGHT
EJ 0085
SHEET 7 OF SHEETS
REV. 4 A
DATE 6/7/85
DRAWN BY: RAT
4 2184 WAH
3 1705 6-11-85 WAH
2 1732 2-14-85 WAH
1 1225 1-7-85 WAH
REV ECN # DATE APPROVED

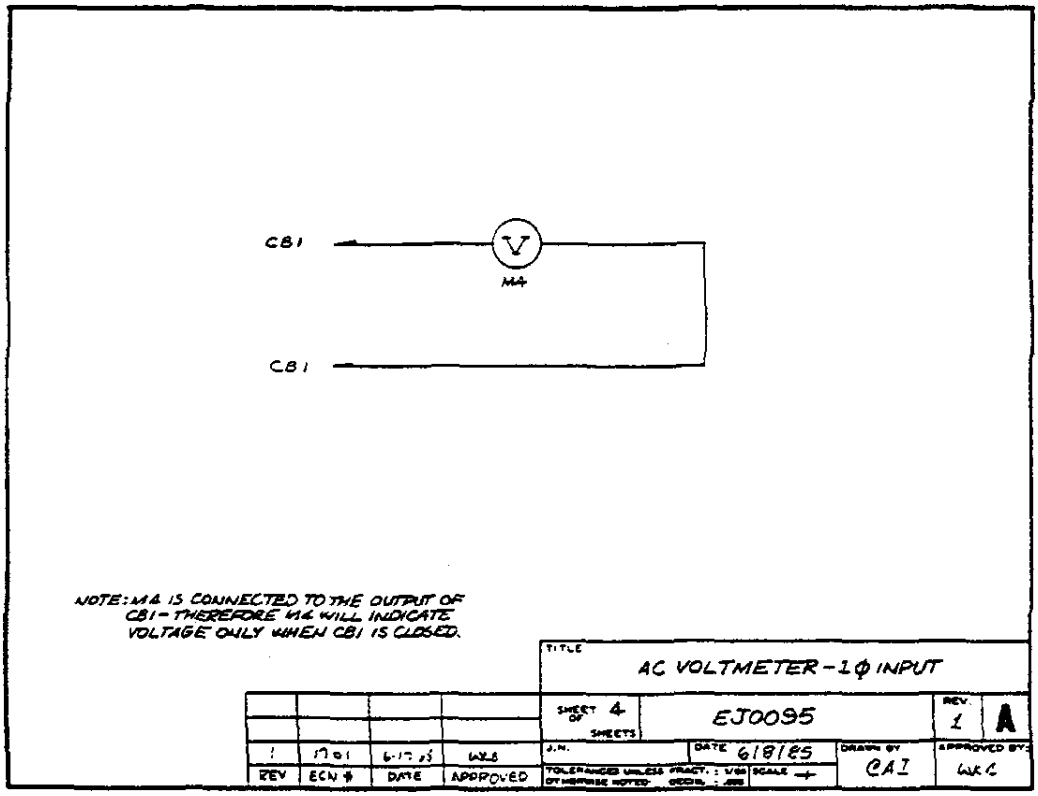

" GROUND DETECTION (+) " (DS13)
R59
R60
R83
T85(-)
T85(+)
K2b
K2a (+)
K3
K2
TO TB3-9
TO TB3-7
TO TB3-8
" GROUND DETECTION (-) " (DS14)
R84
K3b
K3a (-)
TO TB3-12
TO TB3-10
TO TB3-11
SW3
" GROUND DETECTION RELAY RESET "
(CONTACTS SHOWN IN NON-ALARM CONDITION)
TITLE
GROUND DETECTION ALARM RELAYS WITH RESET SWITCH & INDICATING LIGHTS.
EJ 0086
SHEET 5 OF SHEETS
REV. 2 A
DATE 6/10/85
DRAWN BY: CAI
2 1712 6-17-85 LMA
1 1225 1-5-84 MTC
REV ECN # DATE APPROVED

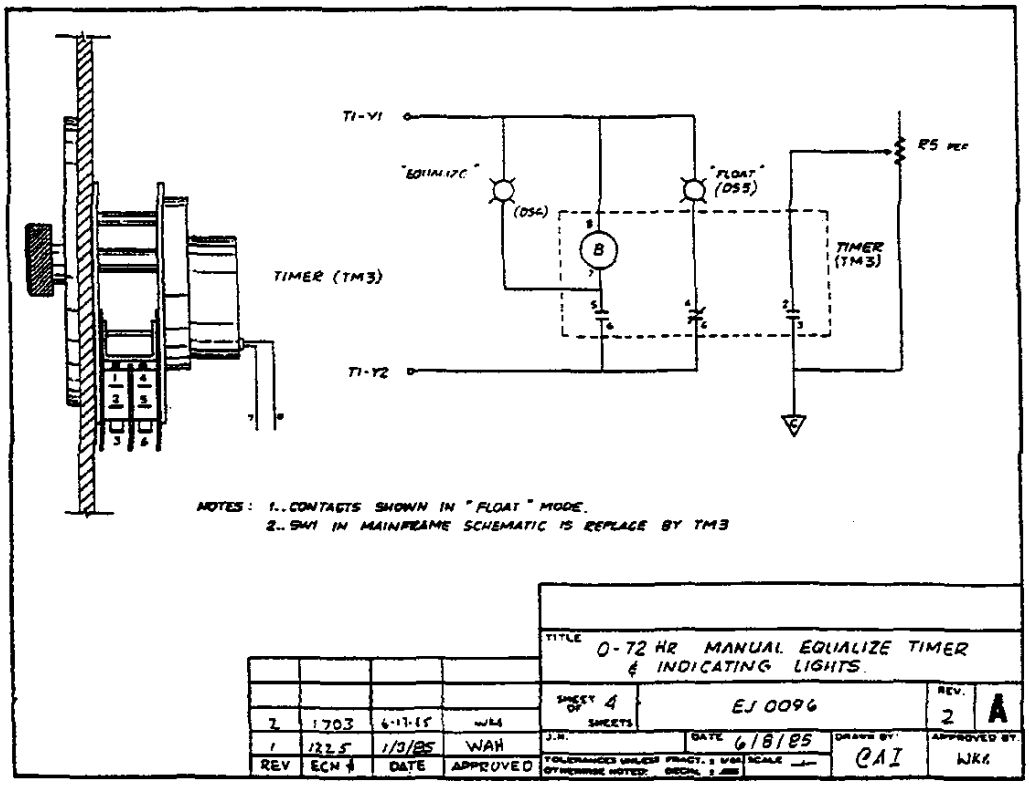

" GROUND DETECTION " (-)
" GROUND DETECTION " (+)
R51
R50
TB5 (+)
TB5 (-)
(DS9)
(DS8)
GROUND DETECTION INDICATING LIGHTS
EJ 0088
SHEET OF 4 SHEETS
REV. 0 A
DATE 6/9/85
DRAWN BY BAI
APPROVED BY WKB
REV ECN # DATE APPROVED
0 1699 6/9/85 WKL

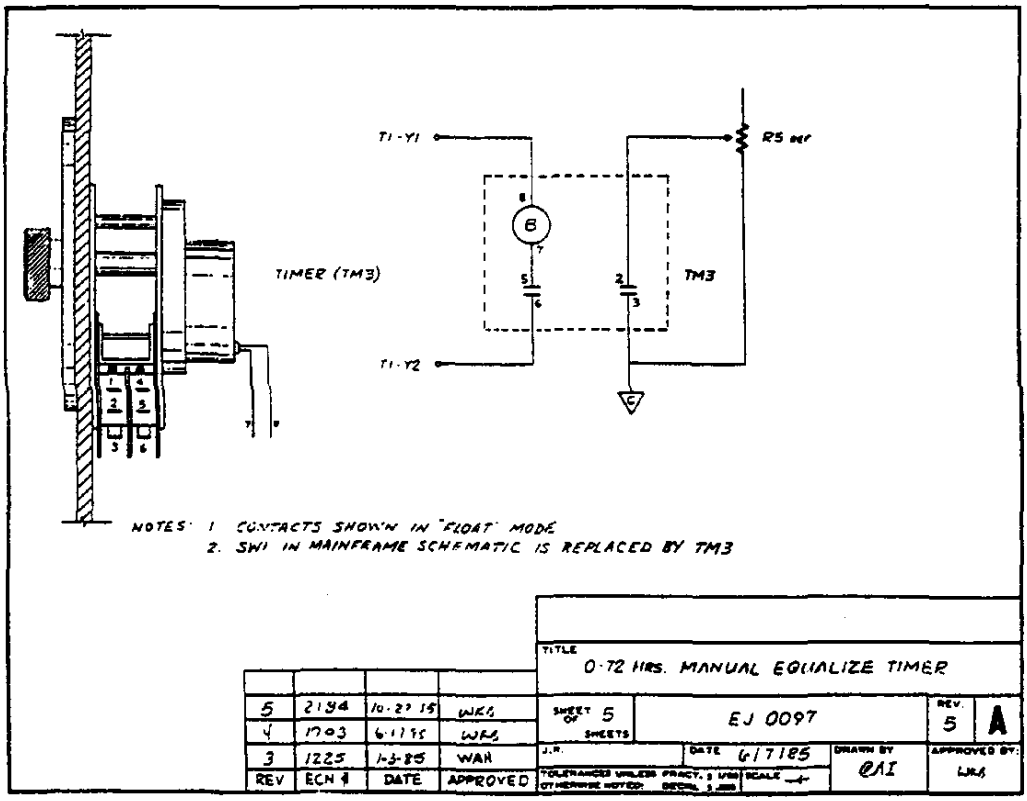

"GND. DET. (-)"
"GND. DET. (+)"
(DS9)
(DS8)
R51
R50
TB5 (+)
TB5 (-)
LAMP (TEST)
SW12
GND. CONNECTION TO CHASSIS
GND.(TEST)
NOTES: (1) SW12 Switch momentary center off (DPDT)
(2) DS8 and DS9 operate from battery charger output voltage
GROUND DETECTION LIGHTS WITH TEST SWITCH
SHEET OF 8 SHEETS
EJ 0089
REV. 4 A
DATE 10/22/84
DRAWN BY BAI
APPROVED BY
REV ECN DATE APPROVED
4 2184 10-22-84 WKL

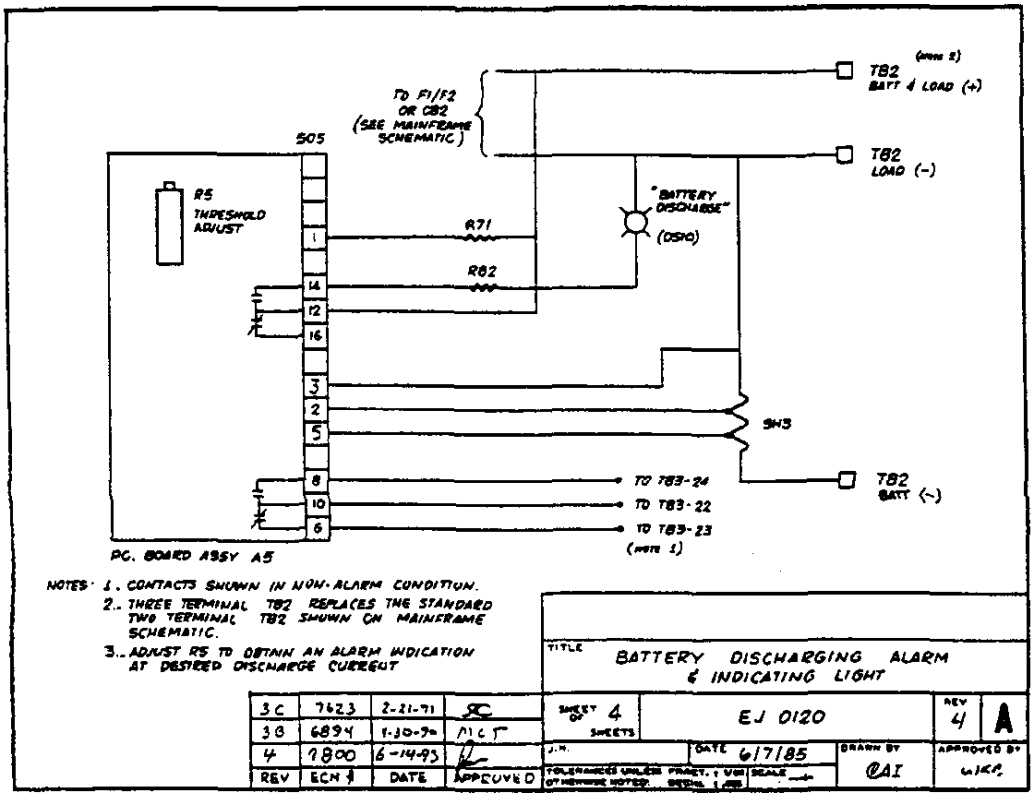

T1-Y1
"EQUALIZE"
"EQUALIZE"
T1-Y2
DS6
"FLOAT"
SW7
DS5
"FLOAT"
R5
NOTES: 1.. SW7 SHOWN IN "FLOAT" POSITION
SW7 REPLACES SW1 IN MAINFRAME SCHEMATIC
TITLE
FLOAT & EQUALIZE INDICATING LIGHTS
SHEET 4 OF 4 SHEETS
EJ 0093
REV. 2 A
J.H.
DATE 6/10/85
DRAWN BY CAI
APPROVED BY WAE
2 169A 6-17-85 WAE
REV ECN # DATE APPROVED

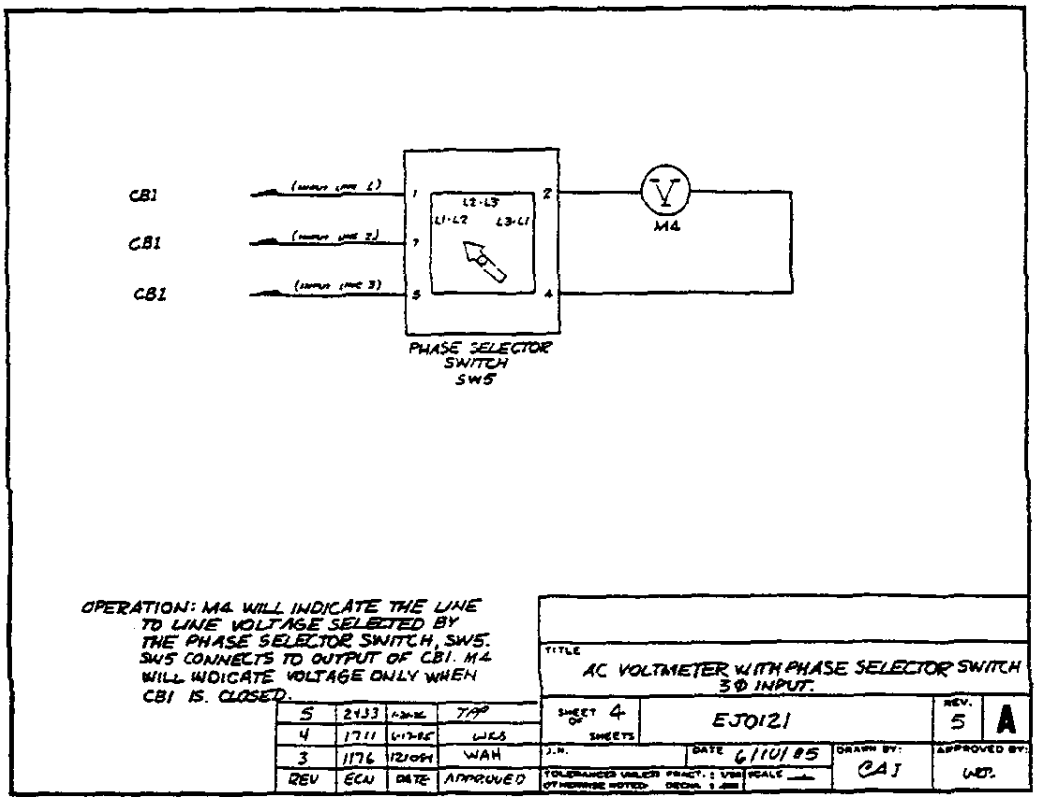

"GND. DET"
"POS. GND."
SW8
M2
TB5 (+)
TB5 (-)
SW9
CHASSIS CONNECTION
"OUTPUT"
"NEG. GND."
NOTE: UPON USING THIS OPTION, M2 ON THE MAINFRAME IS REWIRED AS SHOWN ABOVE.
TITLE
GROUND DETECTION SWITCHES FOR DC VOLTMETER INDICATION
SHEET 4 OF 4 SHEETS
EJ 0094
REV. 4 A
J.H.
DATE 01/15/85
DRAWN BY: CAI
APPROVED BY: TJ
4 3736 3-13-87 CJA
3 2194 10-22-85 WAE
REV ECN # DATE APPROVED

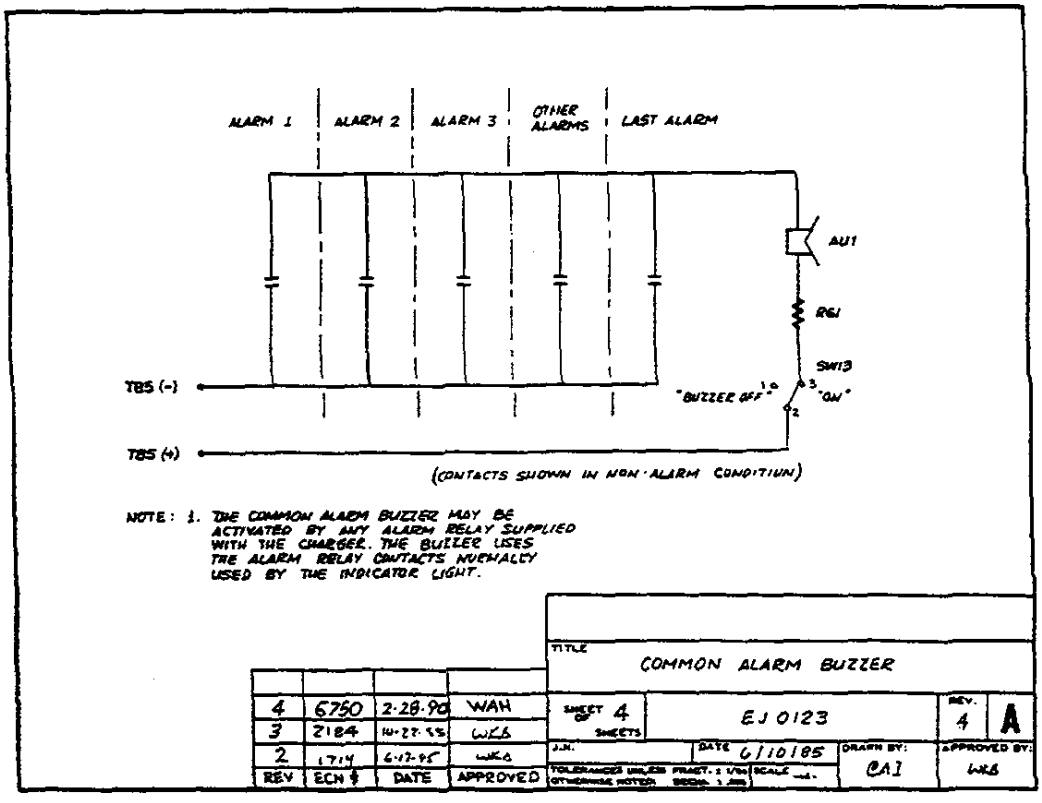

CB1
V
M4
CB1
NOTE: M4 IS CONNECTED TO THE OUTPUT OF CB1 - THEREFORE M4 WILL INDICATE VOLTAGE ONLY WHEN CB1 IS CLOSED.
TITLE
AC VOLTMETER - 1φ INPUT
SHEET OF 4 SHEETS
EJ0095
REV. 1 A
J.N.
DATE 6/8/85
DRAWN BY CAI
APPROVED BY WKC
REV ECN # DATE APPROVED

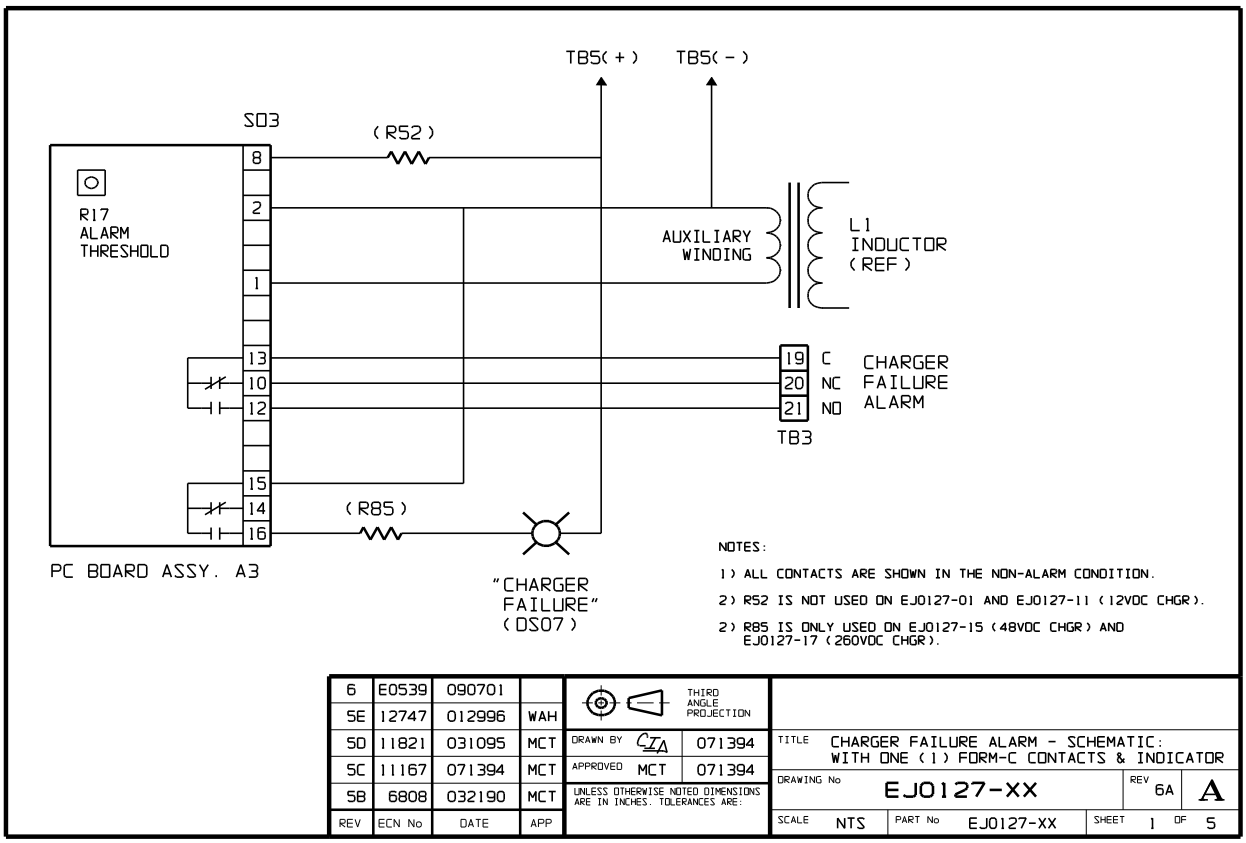

TI-Y1
"EQUALIZE" (DS4)
"FLOAT" (DS5)
RS REF
TIMER (TM3)
TIMER (TM3)
TI-Y2
NOTES: 1. CONTACTS SHOWN IN "FLOAT" MODE.
2. SW1 IN MAINFRAME SCHEMATIC IS REPLACE BY TM3
TITLE
0-72 HR MANUAL EQUALIZE TIMER & INDICATING LIGHTS
SHEET OF 4 SHEETS
EJ 0096
REV. 2 A
J.N.
DATE 6/8/85
DRAWN BY CAI
APPROVED BY WKC
2 1703 6-17-85 WK4
1 1225 1/3/85 WAH
REV ECN # DATE APPROVED


T1-Y1
R5 MF
TIMER (TM3)
TM3
T1-Y2
NOTES: 1. CONTACTS SHOWN IN "FLOAT" MODE
2. SW1 IN MAINFRAME SCHEMATIC IS REPLACED BY TM3
TITLE
0-72 HRS. MANUAL EQUALIZE TIMER
5 2194 10-27-95 WRS
4 1703 6-1195 WRS
3 1225 1-3-85 WAH
REV ECN # DATE APPROVED
SHEET OF 5 SHEETS
EJ 0097
REV. 5 A
J.N.
DATE 6/7/85
DRAWN BY @AI
APPROVED BY: LWS
TOLERANCES UNLESS OTHERWISE NOTED:
SCALE


TO F1/F2 OR CB2 (SEE MAINFRAME SCHEMATIC)
TB2 BATT & LOAD (+)
TB2 LOAD (-)
(note 2)
A5
R5 THRESHOLD ADJUST
R71
R82
"BATTERY DISCHARGE" (DS10)
SW3
TB2 BATT (-)
TO TB3-24
TO TB3-22
TO TB3-23
(note 1)
PC. BOARD ASSY A5
NOTES: 1. CONTACTS SHOWN IN NON-ALARM CONDITION.
2. THREE TERMINAL TB2 REPLACES THE STANDARD TWO TERMINAL TB2 SHOWN ON MAINFRAME SCHEMATIC.
3. ADJUST R5 TO OBTAIN AN ALARM INDICATION AT DESIRED DISCHARGE CURRENT
TITLE
BATTERY DISCHARGING ALARM & INDICATING LIGHT
3C 7623 2-21-71
3B 6894 1-30-90
4 7800 6-14-93
REV ECN # DATE APPROVED
SHEET OF 4 SHEETS
EJ 0120
REV. 4 A
J.N.
DATE 6/7/85
DRAWN BY @AI
APPROVED BY: LWS
TOLERANCES UNLESS OTHERWISE NOTED:
SCALE


CB1
CB1
CB1
L2-L3
L1-L2
L3-L1
M4
PHASE SELECTOR SWITCH SW5
OPERATION: M4 WILL INDICATE THE LINE TO LINE VOLTAGE SELECTED BY THE PHASE SELECTOR SWITCH, SW5. SW5 CONNECTS TO OUTPUT OF CB1. M4 WILL INDICATE VOLTAGE ONLY WHEN CB1 IS CLOSED.
TITLE
AC VOLTMETER WITH PHASE SELECTOR SWITCH 3Φ INPUT.
EJ0121
DRAWN BY: CAJ
APPROVED BY: WEP.


ALARM 1
ALARM 2
ALARM 3
OTHER ALARMS
LAST ALARM
AU1
R61
SW13
TB5 (-)
TB5 (+)
"BUZZER OFF"
"ON"
(CONTACTS SHOWN IN NON-ALARM CONDITION)
NOTE: 1. THE COMMON ALARM BUZZER MAY BE ACTIVATED BY ANY ALARM RELAY SUPPLIED WITH THE CHARGER. THE BUZZER USES THE ALARM RELAY CONTACTS NORMALLY USED BY THE INDICATOR LIGHT.
TITLE
COMMON ALARM BUZZER
EJ 0123
DRAWN BY: CAJ
APPROVED BY: WKB




| REV | ECN No | DATE | APP |
|---|---|---|---|
| 6 | E0539 | 090701 | |
| 5E | 12747 | 012996 | WAH |
| 5D | 11821 | 031095 | MCT |
| 5C | 11167 | 071394 | MCT |
| 5B | 6808 | 032190 | MCT |

THIRD ANGLE PROJECTION

DRAWN BY CZA 071394
APPROVED MCT 071394

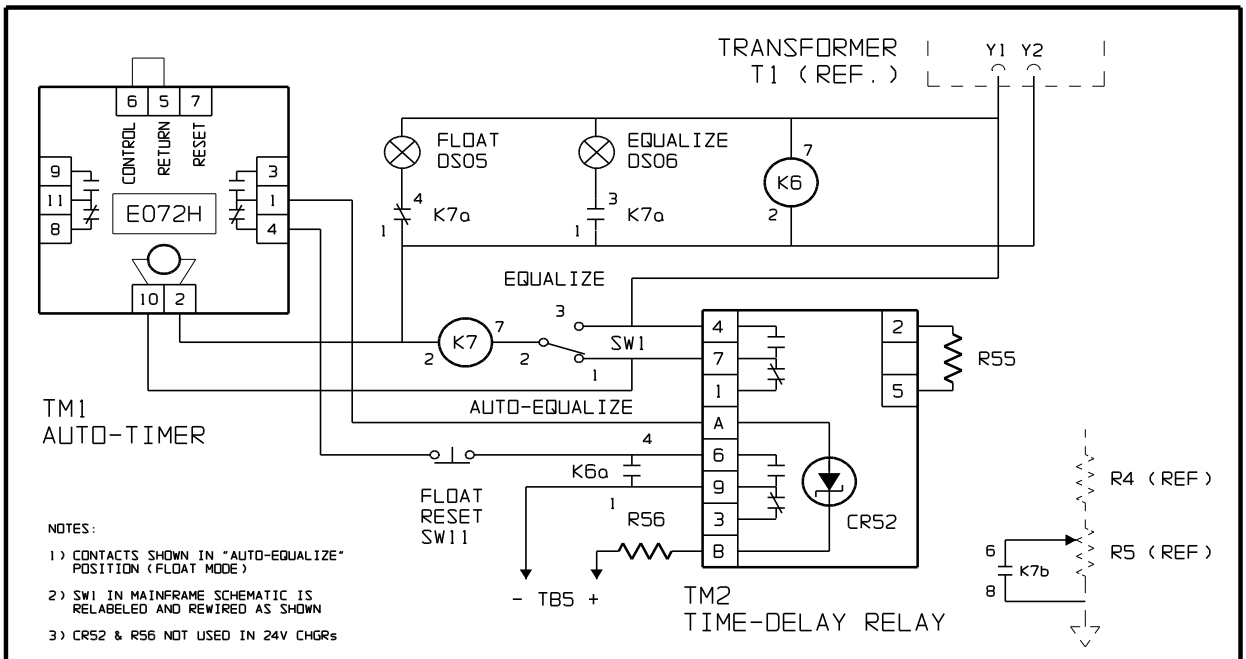
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE CHARGER FAILURE ALARM - SCHEMATIC: WITH ONE (1) FORM-C CONTACTS & INDICATOR

DRAWING No EJ0127-XX REV 6A A

SCALE NTS PART No EJ0127-XX SHEET 1 OF 5

FILENAME [EJ0127-XX.PRT]




| REV | ECN No | DATE | APP |
|---|---|---|---|
| 4 | E1169 | 070903 | |
| 3C | E0779 | 032202 | MCT |
| 3B | 09591 | 022693 | CWF |
| 3B | 07026 | 061490 | CWF |
| 3A | 06050 | 052288 | WKB |

THIRD ANGLE PROJECTION

DRAWN BY 061385
APPROVED WKB 061385

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE OPTION SCHEMATIC: 0-72 HOUR AC LINE FAILURE DIGITAL AUTO-EQUALIZE TIMER W/IND

DRAWING No EJ0131-XX REV 4 A

SCALE NTS PART No EJ0131-XX SHEET 1 OF 2

FILENAME [EJ0131-XX.PRT]

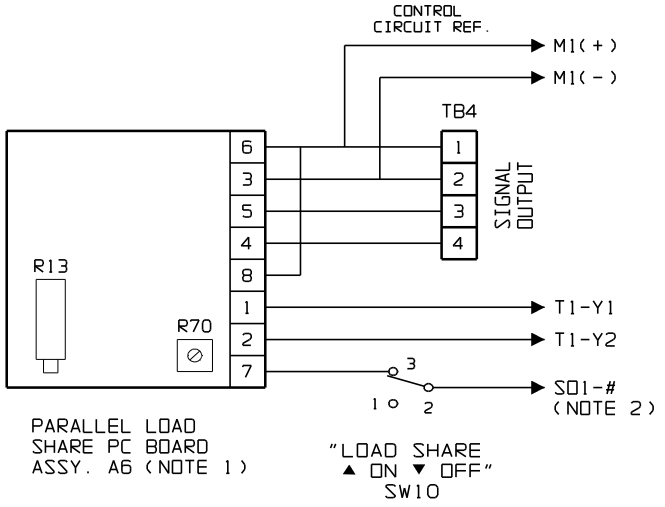
NOTES:

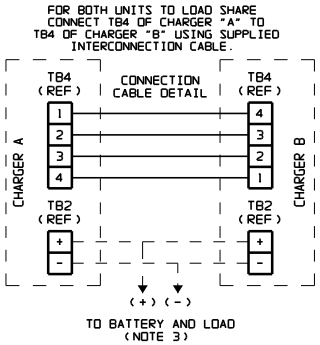
1) EACH LOAD SHARING UNIT (BATTERY CHARGER) REQUIRES ITS OWN LOAD SHARE PC BOARD (A6), AND BOTH UNITS MUST BE OF IDENTICAL DESIGN.

2) SW10-2 CONNECTS TO S01-9 ON 1PH UNITS.
SW10-2 CONNECTS TO S01-4 ON 3PH UNITS.

3) INTERCONNECTION OF DC OUTPUT TERMINALS (TB2) SUPPLIED BY END-USER AND SHOWN HIDDEN.

4) POTENTIOMETER (R13) CAN BE USED TO CORRECT ANY SMALL INEQUALITIES THAT MAY EXIST BECAUSE OF DIFFERENCE IN SHUNTS OR SYSTEM PARAMETERS.





FOR BOTH UNITS TO LOAD SHARE CONNECT TB4 OF CHARGER "A" TO TB4 OF CHARGER "B" USING SUPPLIED INTERCONNECTION CABLE.
TB4 (REF)
CONNECTION CABLE DETAIL
TB4 (REF)
CHARGER A
CHARGER B
TB2 (REF)
TB2 (REF)
(+) (-)
TO BATTERY AND LOAD (NOTE 3)

| REV | ECN No | DATE | APP |
|---|---|---|---|
| 7 | E1485 | 112503 | |
| 6 | E0911 | 071802 | |
| 5A | 11263 | 082394 | CWF |
| 5 | 05961 | 042189 | WKB |
| 4 | 02843 | 052286 | WKB |

THIRD ANGLE PROJECTION

| | | |
|---|---|---|
| DRAWN BY | MCR | 071802 |
| APPROVED | | 071802 |

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE: SCHEMATIC: PARALLEL CHARGER OPERATION WITH 2% FORCED LOAD SHARING (1PH/3PH INPUT)

DRAWING No: EJ0133-00 REV 7 A

SCALE: NTS PART No: EJ0133-00 SHEET 1 OF 2

FILENAME [EJ0133-00.PRT]

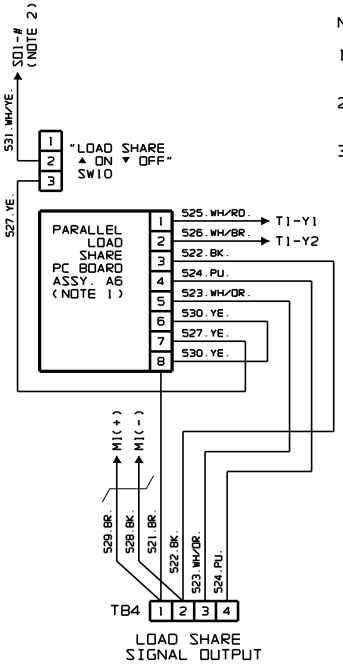
NOTES:

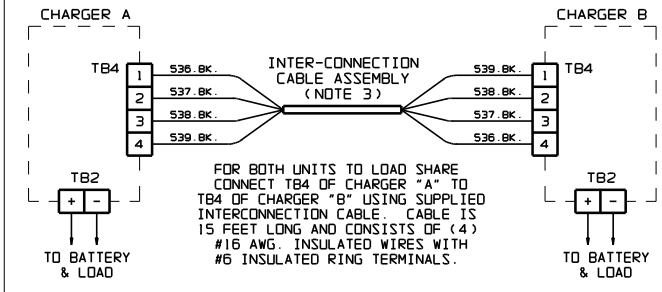
1) EACH LOAD SHARING UNIT (CHARGER) REQUIRES ITS OWN LOAD SHARE BOARD (A6).

2) WIRE 531.WH/YE. CONNECTS SW10-2 TO S01-9 ON 1PH UNITS AND SW10-2 TO S01-4 ON 3PH UNITS.

3) LOAD SHARE INTERCONNECTION CABLE ASSEMBLY IS PART No. EH0603-00.

| WIRE LIST | | | |
|---|---|---|---|
| No. | CODE | FROM | TO |
| 521 | BR | A6-8 | TB4-1 |
| 522 | BK | A6-3 | TB4-2 |
| 523 | WH/OR | A6-5 | TB4-3 |
| 524 | PU | A6-4 | TB4-4 |
| 525 | WH/RD | A6-1 | T1-Y1 |
| 526 | WH/BR | A6-2 | T1-Y2 |
| 527 | YE | A6-7 | SW10-3 |
| 528 | BK | TB4-2 | M1(-) |
| 529 | BR | TB4-1 | M1(+) |
| 530 | YE | A6-6 | A6-8 |
| 531 | WH/YE | SW10-2 | (NOTE 2) |




THIRD ANGLE PROJECTION

| | | |
|---|---|---|
| DRAWN BY | MCR | 071802 |
| APPROVED | | 071802 |

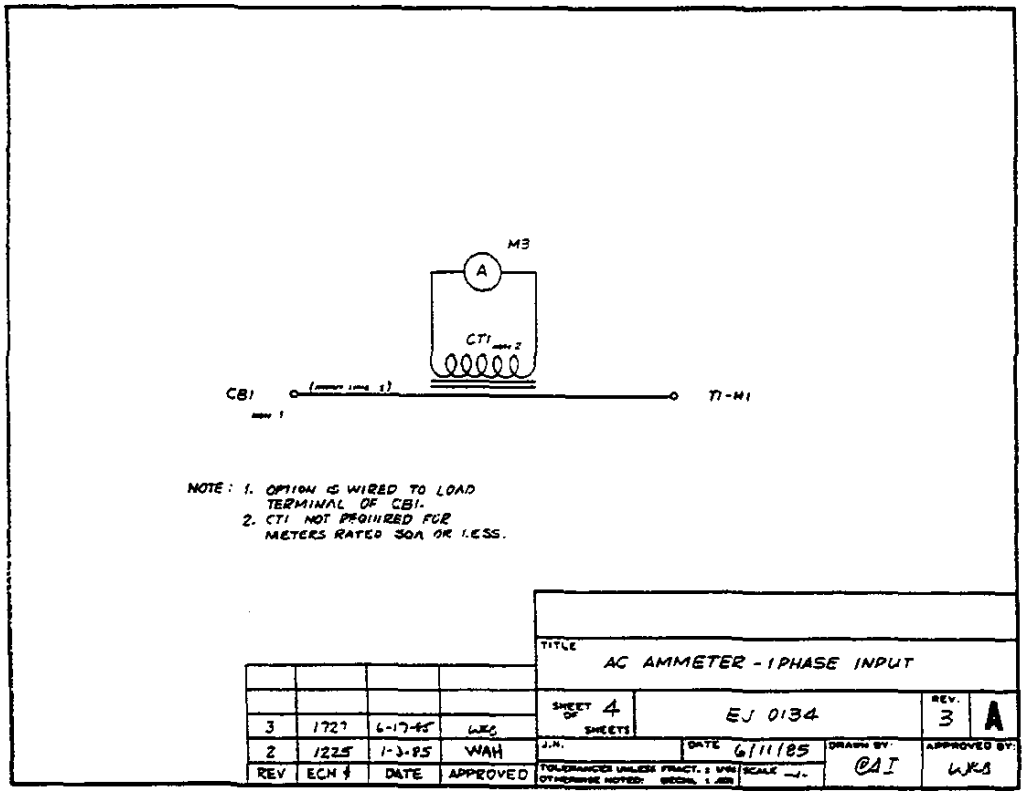
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

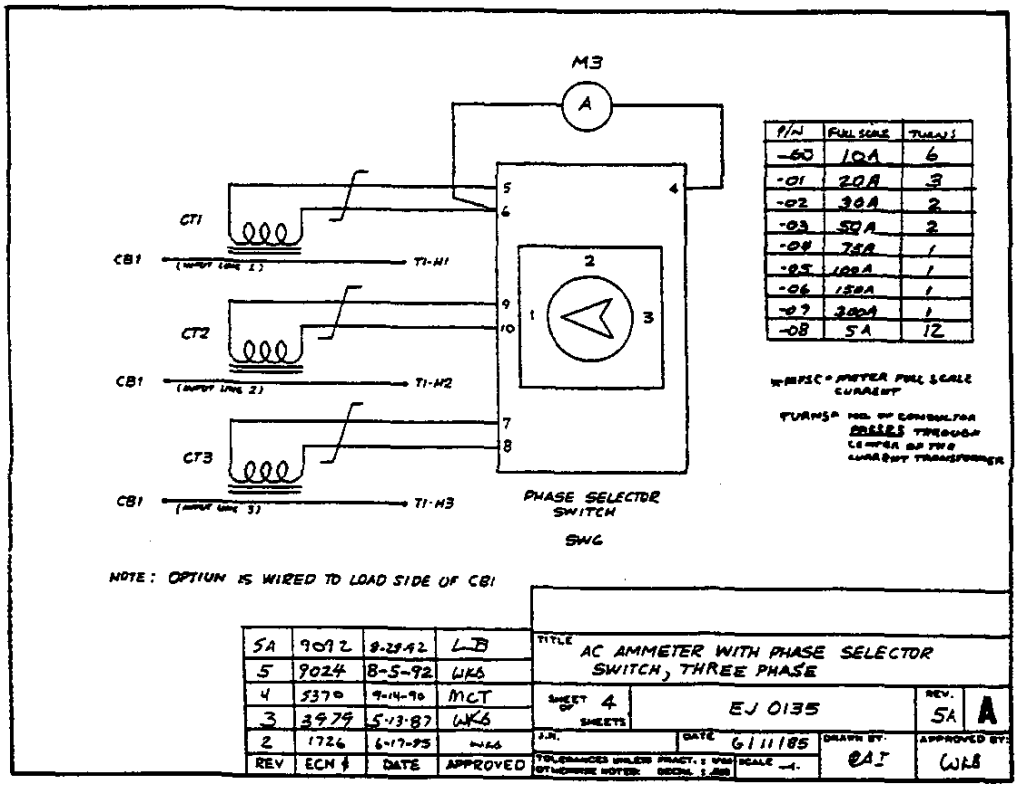
TITLE: CONNECTION DIAGRAM: PARALLEL CHARGER OPERATION WITH 2% FORCED LOAD SHARING (1PH/3PH INPUT)

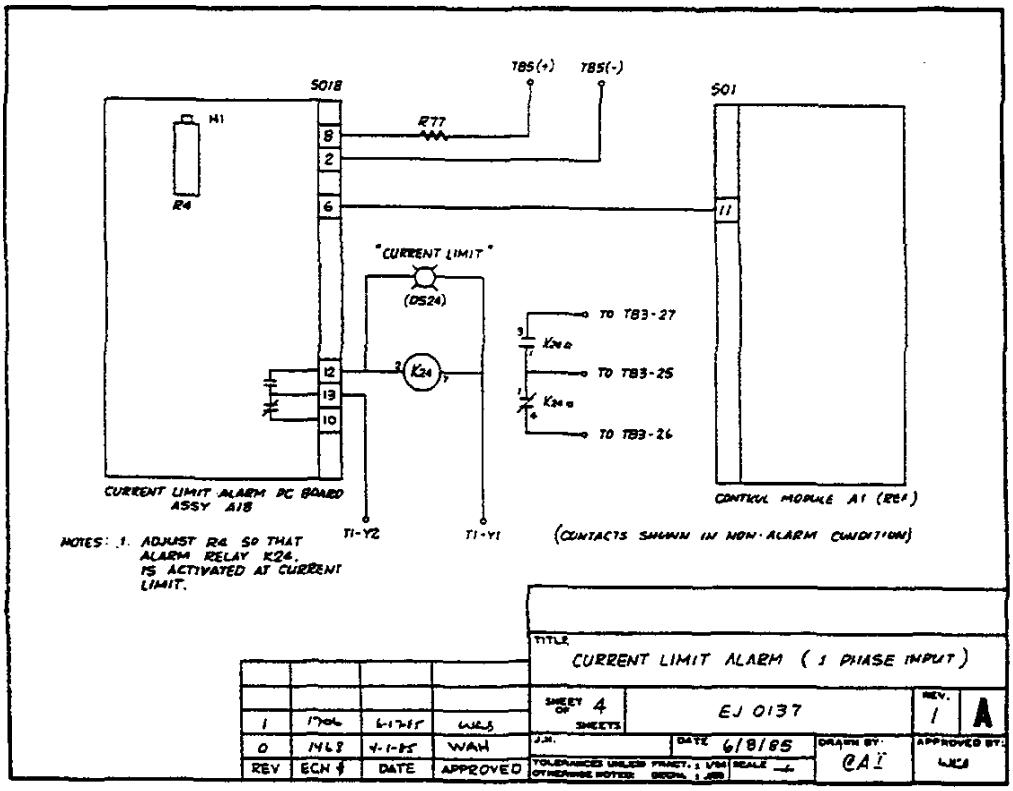
DRAWING No: EJ0133-00 REV 7 A

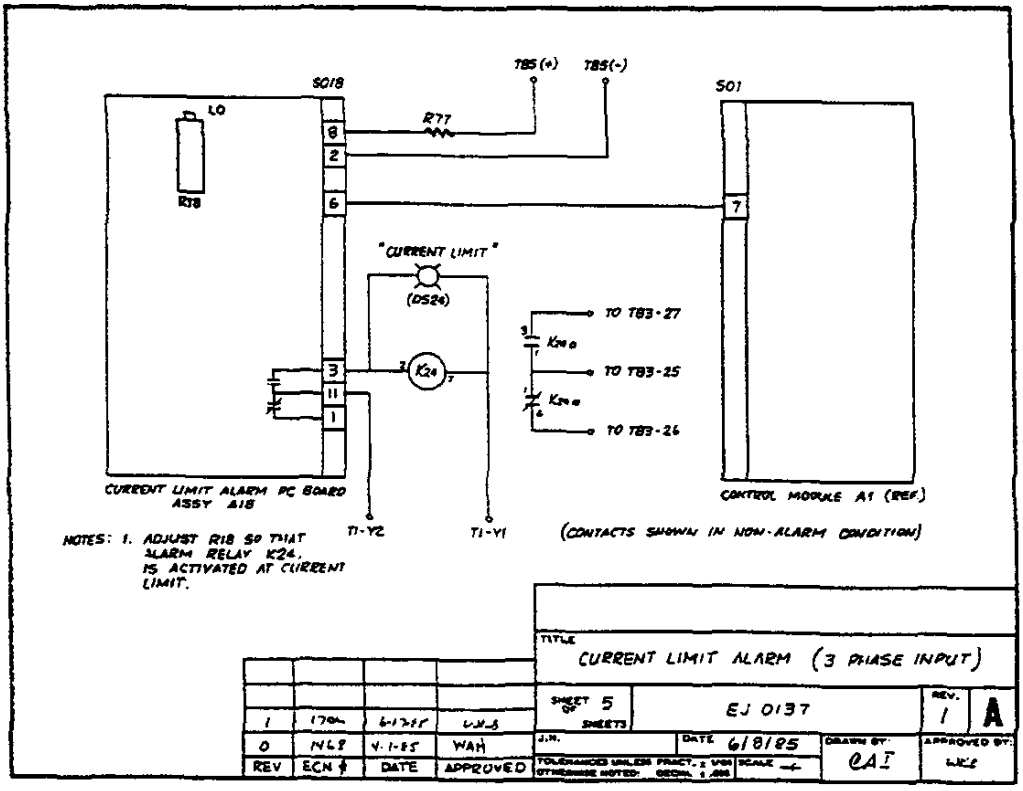
SCALE: NTS PART No: EJ0133-00 SHEET 2 OF 2

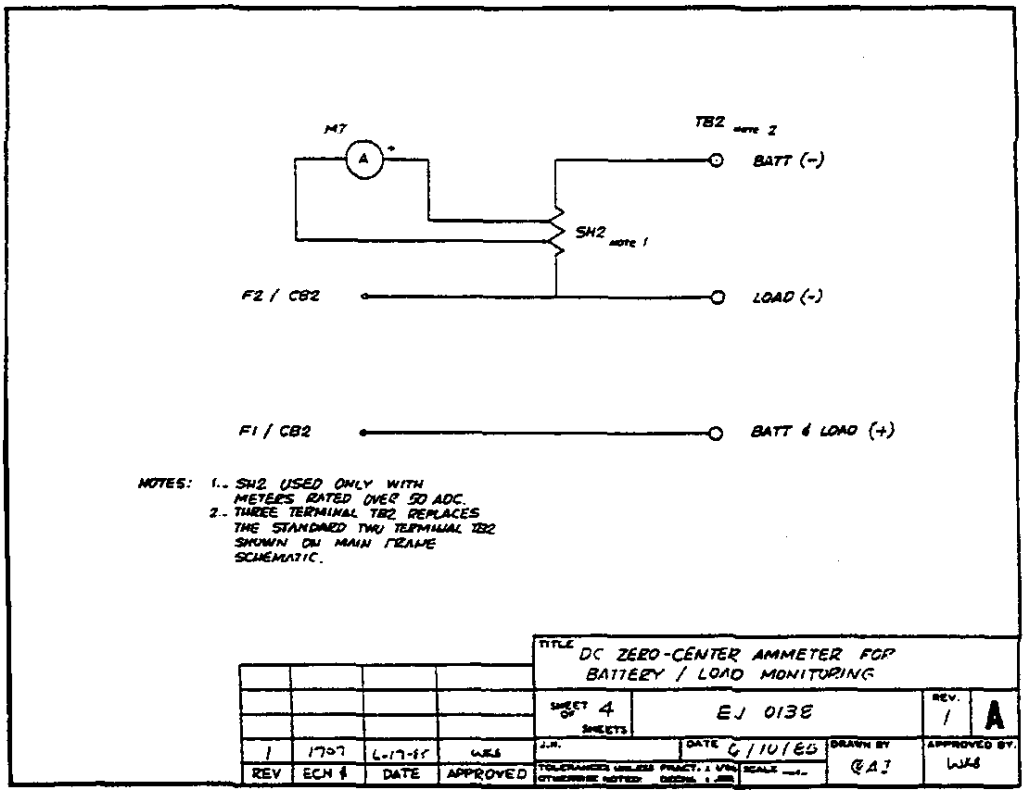
FILENAME [EJ0133-00.PRT]

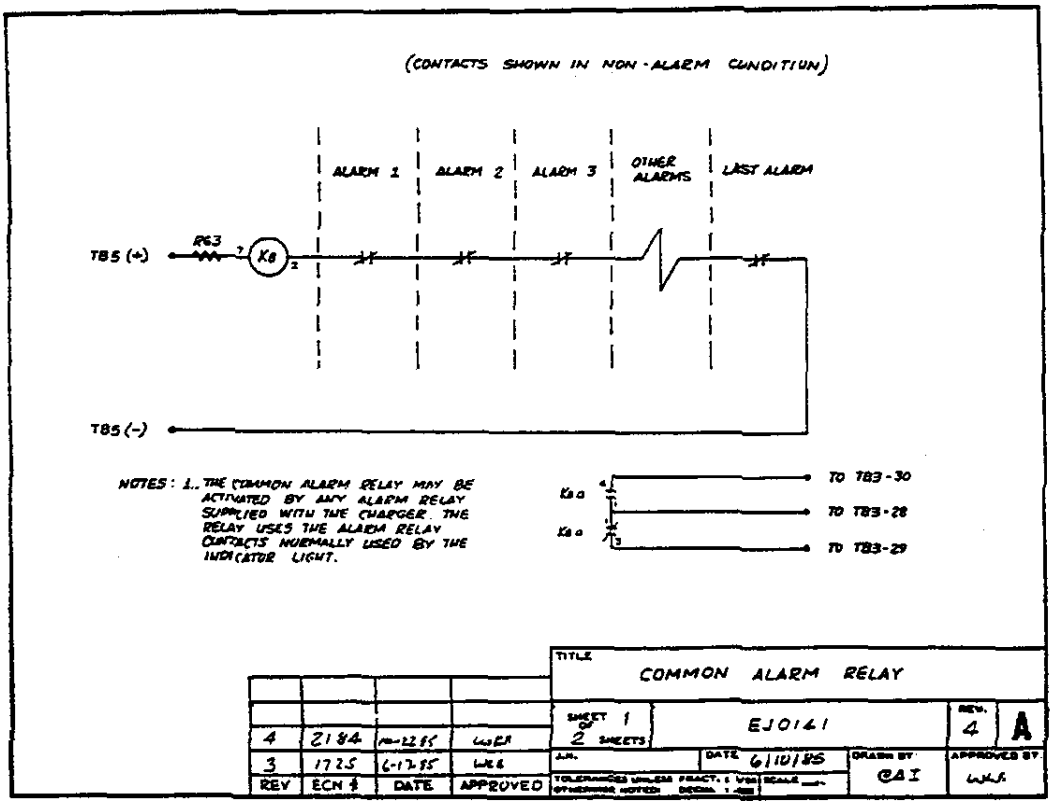

M3
A
CT1
CB1
T1-H1
NOTE : 1. OPTION IS WIRED TO LOAD TERMINAL OF CB1.
2. CT1 NOT REQUIRED FOR METERS RATED 50A OR LESS.
TITLE
AC AMMETER - 1PHASE INPUT
SHEET OF 4 SHEETS
EJ 0134
REV. 3 A
J.N.
DATE 6/11/85
DRAWN BY: CAI
APPROVED BY: WKB
TOLERANCES UNLESS OTHERWISE NOTED: FRACT. ± 1/64 DECIMAL ± .005
SCALE —/—
3 1727 6-17-85 WKB
2 1225 1-3-85 WAH
REV ECN # DATE APPROVED

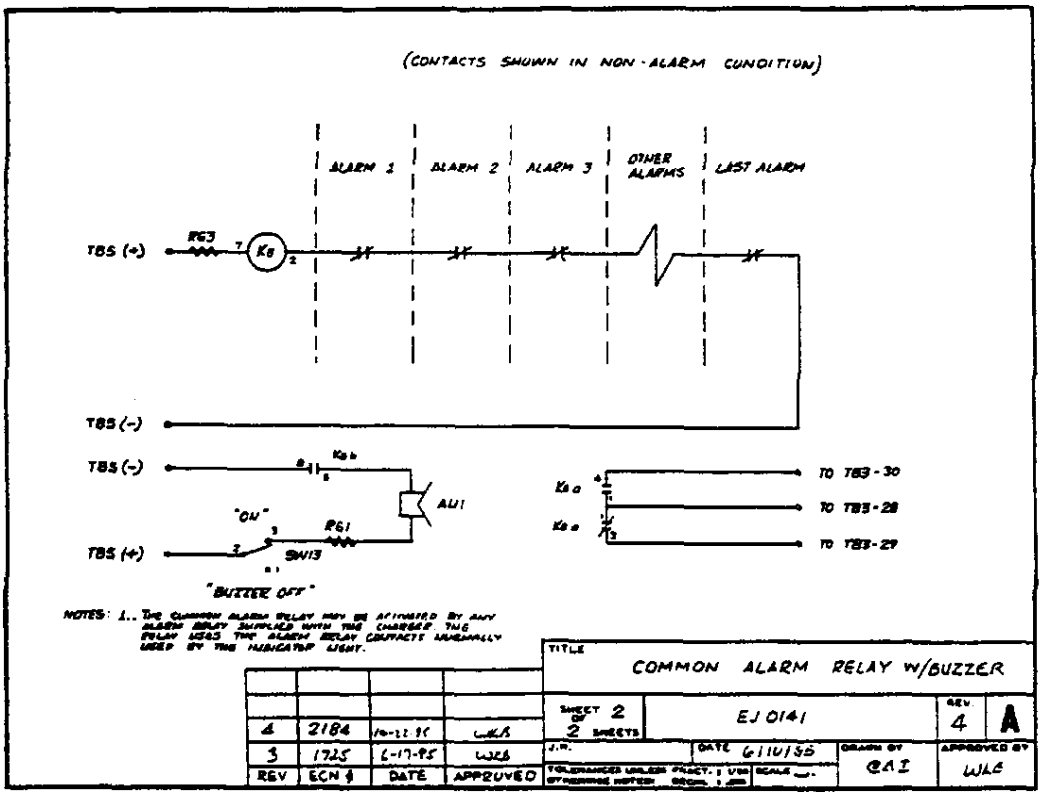

M3
A
CT1
CT2
CT3
CB1
T1-H1
T1-H2
T1-H3
PHASE SELECTOR SWITCH
SW6
P/N | FULL SCALE | TURNS
-00 | 10A | 6
-01 | 20A | 3
-02 | 30A | 2
-03 | 50A | 2
-04 | 75A | 1
-05 | 100A | 1
-06 | 150A | 1
-07 | 200A | 1
-08 | 5A | 12
NOTE : OPTION IS WIRED TO LOAD SIDE OF CB1
TITLE
AC AMMETER WITH PHASE SELECTOR SWITCH, THREE PHASE
SHEET OF 4 SHEETS
EJ 0135
REV. 5A A
J.N.
DATE 6/11/85
DRAWN BY: CAI
APPROVED BY: WKB
SCALE —/—
5A 9092 8-28-92 LJB
5 9024 8-5-92 WKB
4 5370 9-14-90 MCT
3 3479 5-13-87 WKB
2 1726 6-17-85 WKB
REV ECN # DATE APPROVED

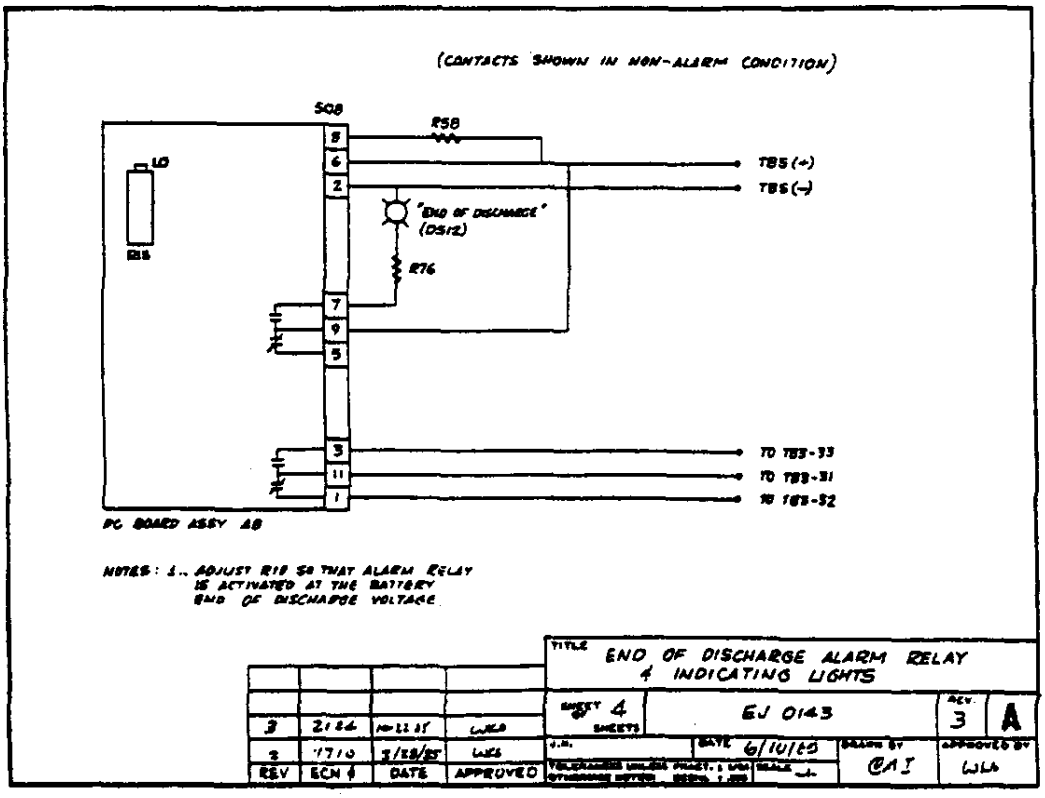

TB5(+)
TB5(-)
S018
S01
H1
R4
R77
"CURRENT LIMIT"
(DS24)
K24
TO TB3-27
TO TB3-25
TO TB3-26
CURRENT LIMIT ALARM PC BOARD ASSY A18
CONTROL MODULE A1 (REF.)
T1-Y2
T1-Y1
(CONTACTS SHOWN IN NON-ALARM CONDITION)
NOTES: 1. ADJUST R4 SO THAT ALARM RELAY K24. IS ACTIVATED AT CURRENT LIMIT.
TITLE
CURRENT LIMIT ALARM ( 1 PHASE INPUT)
SHEET 4 OF SHEETS
EJ 0137
REV. 1 A
DATE 6/8/85
DRAWN BY: CAI
APPROVED BY:
REV
ECN #
DATE
APPROVED

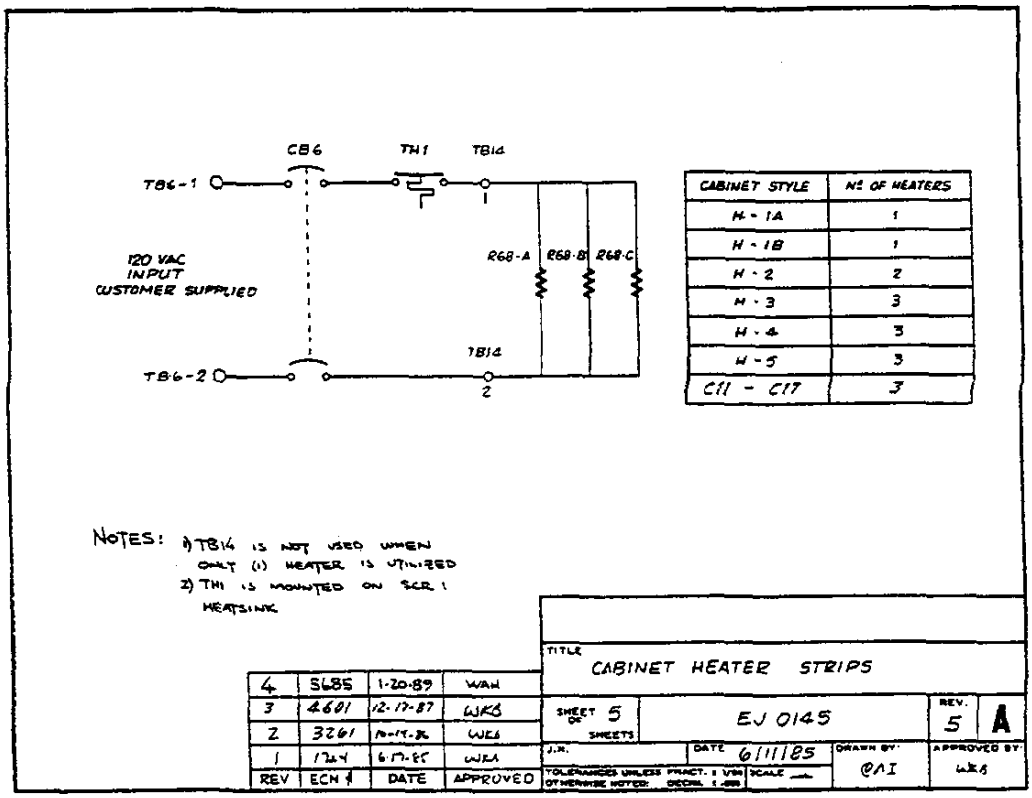

TB5(+)
TB5(-)
S018
S01
LO
R18
R77
"CURRENT LIMIT"
(DS24)
K24
TO TB3-27
TO TB3-25
TO TB3-26
CURRENT LIMIT ALARM PC BOARD ASSY A18
CONTROL MODULE A1 (REF.)
T1-Y2
T1-Y1
(CONTACTS SHOWN IN NON-ALARM CONDITION)
NOTES: 1. ADJUST R18 SO THAT ALARM RELAY K24. IS ACTIVATED AT CURRENT LIMIT.
TITLE
CURRENT LIMIT ALARM (3 PHASE INPUT)
SHEET 5 OF SHEETS
EJ 0137
REV. 1 A
DATE 6/8/85
DRAWN BY: CAI
APPROVED BY:
REV
ECN #
DATE
APPROVED

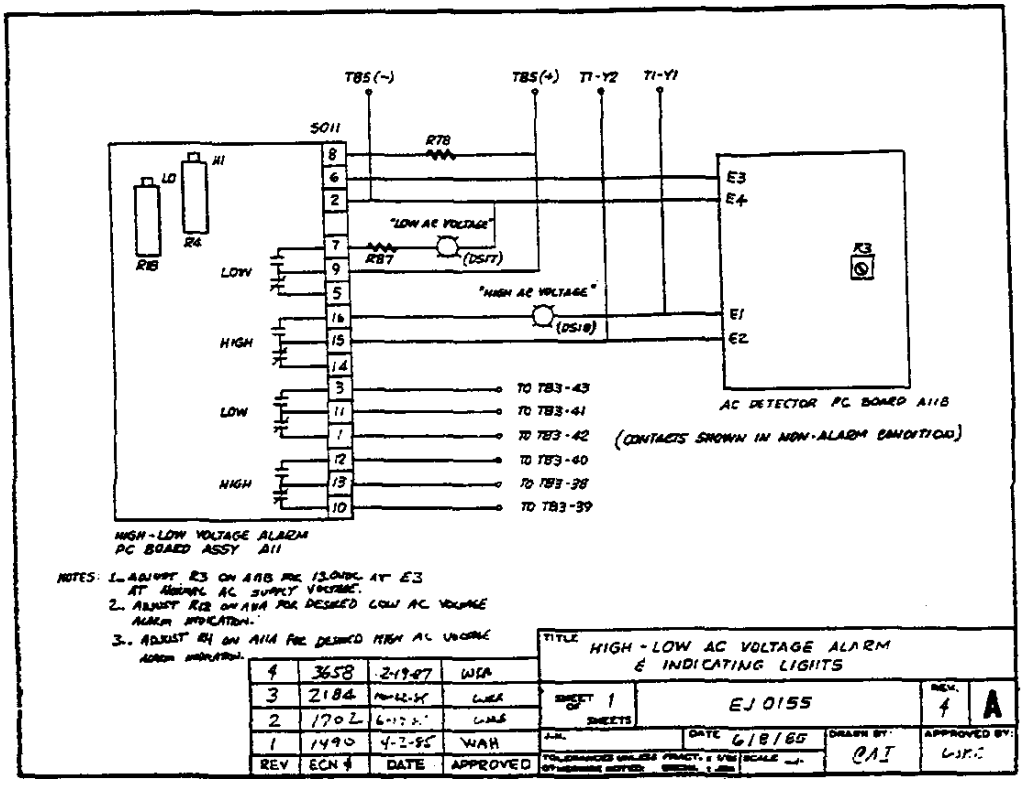

M7
A
+
TB2 note 2
BATT (-)
SH2 note 1
F2 / CB2
LOAD (-)
F1 / CB2
BATT & LOAD (+)
NOTES: 1.. SH2 USED ONLY WITH METERS RATED OVER 50 ADC.
2.. THREE TERMINAL TB2 REPLACES THE STANDARD TWO TERMINAL TB2 SHOWN ON MAIN FRAME SCHEMATIC.
TITLE
DC ZERO-CENTER AMMETER FOR BATTERY / LOAD MONITORING
SHEET 4 OF 4 SHEETS
EJ 0138
REV. 1 A
J.H.
DATE 6/10/85
DRAWN BY CAI
APPROVED BY WLS
1 1707 6-17-85 WLS
REV ECN # DATE APPROVED
TOLERANCES UNLESS OTHERWISE NOTED: FRACT. ± 1/64 DECIM. ± .005 ANGL. ± 1°
SCALE —

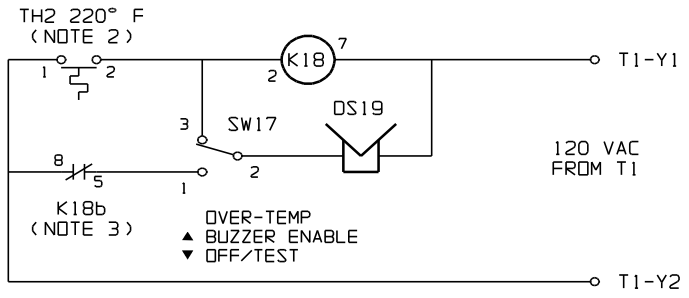

(CONTACTS SHOWN IN NON-ALARM CONDITION)
ALARM 1
ALARM 2
ALARM 3
OTHER ALARMS
LAST ALARM
TB5 (+)
RG3
K8
TB5 (-)
NOTES: 1.. THE COMMON ALARM RELAY MAY BE ACTIVATED BY ANY ALARM RELAY SUPPLIED WITH THE CHARGER. THE RELAY USES THE ALARM RELAY CONTACTS NORMALLY USED BY THE INDICATOR LIGHT.
K8a
K8a
TO TB3-30
TO TB3-28
TO TB3-29
TITLE
COMMON ALARM RELAY
SHEET 1 OF 2 SHEETS
EJ0141
REV. 4 A
J.H.
DATE 6/10/85
DRAWN BY CAI
APPROVED BY W.L.S.
4 2184 11-22-85 WLS
3 1725 6-17-85 WLS
REV ECN # DATE APPROVED
TOLERANCES UNLESS OTHERWISE NOTED: FRACT. ± 1/64 DECIM. ± .005 ANGL. ± 1°
SCALE —


(CONTACTS SHOWN IN NON-ALARM CONDITION)
ALARM 1
ALARM 2
ALARM 3
OTHER ALARMS
LAST ALARM
TBS (+)
R63
K8
TBS (-)
K8b
AU1
"ON"
R61
SW13
"BUZZER OFF"
K8a
TO TB3-30
TO TB3-28
TO TB3-29
NOTES: 1.. THE COMMON ALARM RELAY MAY BE ACTIVATED BY ANY ALARM RELAY SUPPLIED WITH THE CHARGER. THE RELAY USES THE ALARM RELAY CONTACTS NORMALLY USED BY THE INDICATOR LIGHT.
TITLE
COMMON ALARM RELAY W/BUZZER
SHEET 2 OF 2 SHEETS
EJ 0141
REV 4
A
4 2184 10-12-95 WLA
3 1725 6-17-95 WLA
REV ECN # DATE APPROVED
DRAWN BY CAI
APPROVED BY WLA


(CONTACTS SHOWN IN NON-ALARM CONDITION)
SQ8
R58
LD
DS12
"END OF DISCHARGE" (DS12)
R76
TBS (+)
TBS (-)
TO TB3-33
TO TB3-31
TO TB3-32
PC BOARD ASSY A8
NOTES: 1.. ADJUST R58 SO THAT ALARM RELAY IS ACTIVATED AT THE BATTERY END OF DISCHARGE VOLTAGE.
TITLE
END OF DISCHARGE ALARM RELAY 4 INDICATING LIGHTS
SHEET 4 OF 4 SHEETS
EJ 0143
REV 3
A
3 2184 10-12-95 WLA
2 1710 3/28/95 WLA
REV ECN # DATE APPROVED
DRAWN BY CAI
APPROVED BY WLA


CB6
TH1
TB14
TB6-1
120 VAC
INPUT
CUSTOMER SUPPLIED
R68-A
R68-B
R68-C
TB14
2
TB6-2
CABINET STYLE | Nº OF HEATERS
H-1A | 1
H-1B | 1
H-2 | 2
H-3 | 3
H-4 | 3
H-5 | 3
C11 - C17 | 3
NOTES: 1) TB14 IS NOT USED WHEN ONLY (1) HEATER IS UTILIZED
2) TH1 IS MOUNTED ON SCR 1 HEATSINK
TITLE
CABINET HEATER STRIPS
SHEET OF 5 SHEETS
EJ 0145
REV. 5 A
DATE 6/11/85
DRAWN BY: @AI
APPROVED BY: WKS
4 | 5685 | 1-20-89 | WAH
3 | 4601 | 12-17-87 | WKS
2 | 3261 | [illegible] | WKS
1 | 1724 | 6-17-85 | WKS
REV | ECN # | DATE | APPROVED


TB5(-)
TB5(+)
T1-Y2
T1-Y1
5011
R78
HI
LO
R4
R18
"LOW AC VOLTAGE"
R87
(DS17)
"HIGH AC VOLTAGE"
(DS18)
LOW
HIGH
LOW
HIGH
E3
E4
E1
E2
R3
TO TB3-43
TO TB3-41
TO TB3-42
TO TB3-40
TO TB3-38
TO TB3-39
AC DETECTOR PC BOARD A11B
(CONTACTS SHOWN IN NON-ALARM CONDITION)
HIGH-LOW VOLTAGE ALARM PC BOARD ASSY A11
NOTES: 1. ADJUST R3 ON A11B FOR 13.0VDC AT E3 AT NOMINAL AC SUPPLY VOLTAGE.
2. ADJUST R18 ON A11A FOR DESIRED LOW AC VOLTAGE ALARM INDICATION.
3. ADJUST R4 ON A11A FOR DESIRED HIGH AC VOLTAGE ALARM INDICATION.
TITLE
HIGH-LOW AC VOLTAGE ALARM & INDICATING LIGHTS
SHEET OF 1 SHEETS
EJ 0155
REV. 4 A
DATE 6/18/85
DRAWN BY: @AI
APPROVED BY: WKS
4 | 3658 | 2-19-87 | WKS
3 | 2184 | [illegible] | WKS
2 | 1702 | 6-17-85 | WKS
1 | 1490 | 4-2-85 | WAH
REV | ECN # | DATE | APPROVED

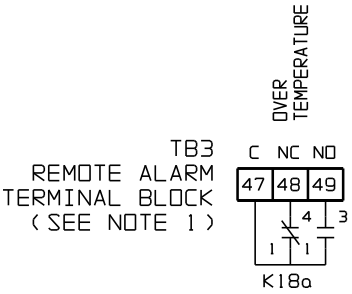



NOTES:

1) ALARM CONTACTS SHOWN IN NON-ALARM CONDITION. CONTACT RATING: 0.5A 125VAC/DC RESISTIVE.

2) THERMOSTAT(S) TH2 CLOSE ON RISE (220°F) AND IS SELF-RESETTING.

3) K18b PROVIDES "CALL-BACK" FEATURE. WHEN OVER-TEMPERATURE IS CORRECTED, RESET SWITCH SW17 TO "ENABLE" POSITION.




| REV | ECN No | DATE | APP |
|---|---|---|---|
| 6 | E1391 | 091903 | |
| 5 | E0083 | 051600 | |
| 4C | 13191 | 061796 | WAH |
| 4B | 10712 | 021794 | CWF |
| 4A | 9634 | 030893 | CWF |

THIRD ANGLE PROJECTION

| | | |
|---|---|---|
| DRAWN BY | CIA | 061785 |
| APPROVED | WAH | 061785 |

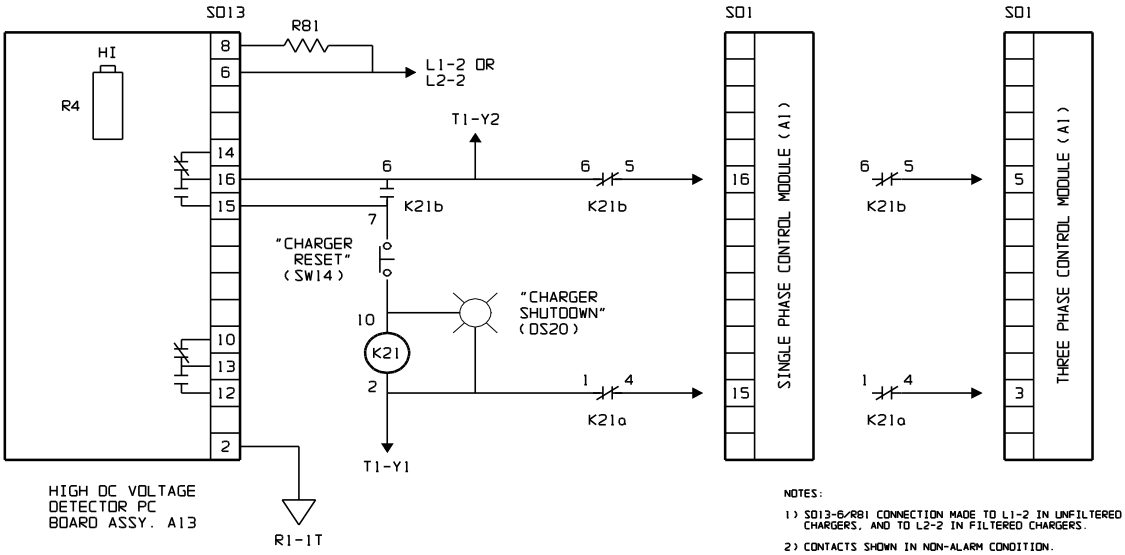
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE: SCR/SCRF SERIES OPTION SCHEMATIC: OVER TEMPERATURE ALARM W/BUZZER

DRAWING No: EJ0439-01 | REV: 6 | A

SCALE: NTS | PART No: EJ0439-01 | SHEET: 1 OF 3

FILENAME [EJ0439-01.PRT]



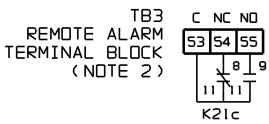

NOTES:

1) SO13-6/R81 CONNECTION MADE TO L1-2 IN UNFILTERED CHARGERS, AND TO L2-2 IN FILTERED CHARGERS.

2) CONTACTS SHOWN IN NON-ALARM CONDITION.

3) R81 NOT USED ON 12Vdc CHARGERS.

4) ADJUST R4 ON A13 PC BOARD TO OBTAIN CHARGER SHUTDOWN AT DESIRED BATTERY VOLTAGE.




| REV | ECN No | DATE | APP |
|---|---|---|---|
| 5 | E1494 | 120403 | |
| 4C | 12150 | 061595 | WKB |
| 4B | 10993 | 050994 | WKB |
| 4A | 9009 | 073192 | WKB |
| 0 | 1219 | 122184 | WAH |

THIRD ANGLE PROJECTION

| | | |
|---|---|---|
| DRAWN BY | | 060685 |
| APPROVED | WKB | 060685 |

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

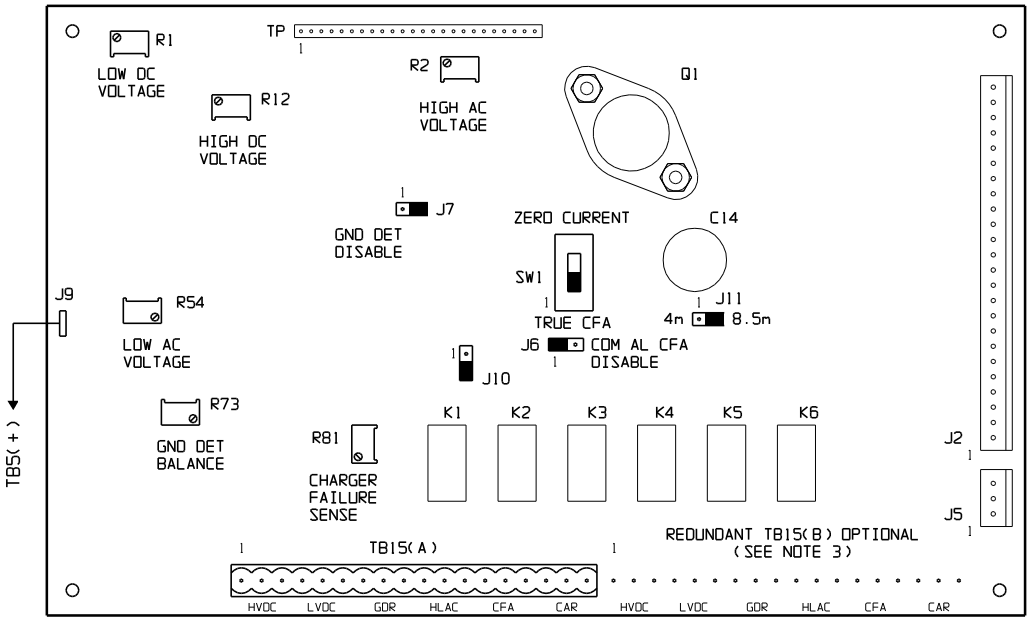
TITLE: OPTION SCHEMATIC: HIGH DC VOLTAGE CHARGER SHUTDOWN W/INDICATOR

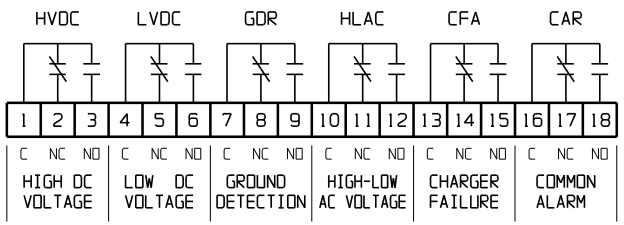
DRAWING No: EJ0592-XX | REV: 5 | A

SCALE: NTS | PART No: EJ0592-XX | SHEET: 1 OF 2

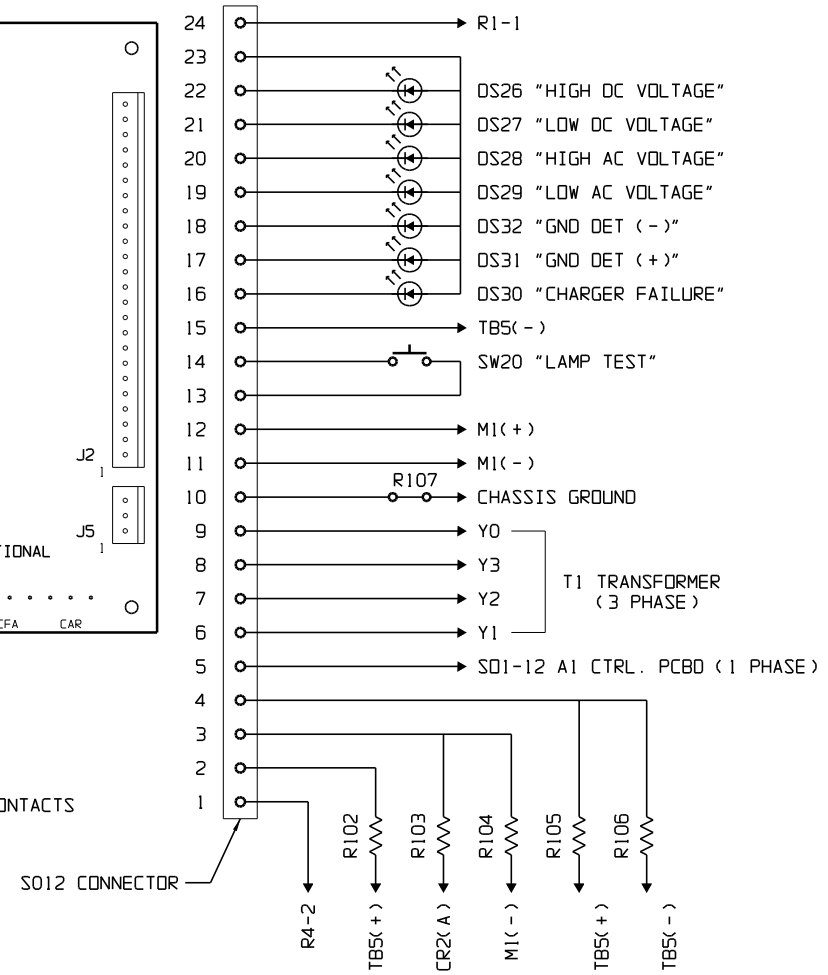
FILENAME [EJ0592-XX.PRT]

EN0014 PCBD. ASSEMBLY A24 COMBINED ALARM-STATUS CHARGER MONITOR





HVDC LVDC GDR HLAC CFA CAR
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
C NC NO
HIGH DC VOLTAGE
LOW DC VOLTAGE
GROUND DETECTION
HIGH-LOW AC VOLTAGE
CHARGER FAILURE
COMMON ALARM

TB15(A) PLUG
CUSTOMER ALARM CONTACTS
(SEE NOTE 1)




NOTES:

1) TB15 CONTACTS SHOWN IN NON-ALARM CONDITION. CONTACTS ARE RATED 0.5A, 125V AC/DC RESISTIVE.

2) SO12 CONNECTOR ENGAGES WITH J2 ON BOARD.

3) REDUNDANT TB15 IS SUPPLIED WHEN TWO SETS OF FORM "C" CONTACTS ARE REQUESTED.

4) JUMPERS FOR J6 AND J7 SHOWN IN "ENABLE" POSITION. (SEE MANUAL SECTION 5-19 FOR DETAILS)

5) J10 IS FOR FACTORY USE ONLY.

6) J11 SHOWN IN "8.5 MINUTE" POSITION. (SEE MANUAL SECTION 5-19 FOR DETAILS)

7) SW1 SHOWN IN "TRUE CFA" POSITION.

| REV | ECN No | DATE | APP |
|---|---|---|---|
| 12 | E0582 | 101001 | |
| 11 | 14451 | 081597 | MCT |
| 10 | 13880 | 012797 | MCT |
| 9 | 13637 | 110496 | WKB |
| 8 | 12764 | 020296 | WKB |

THIRD ANGLE PROJECTION

| | | |
|---|---|---|
| DRAWN BY | CIA | 091990 |
| APPROVED | WKB | 020296 |

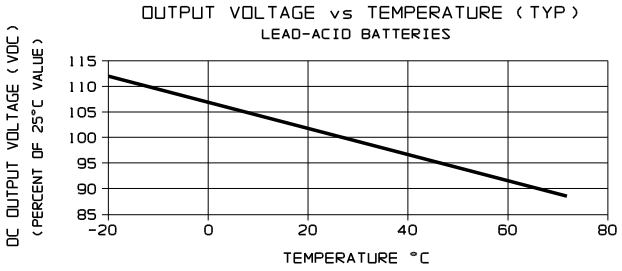
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

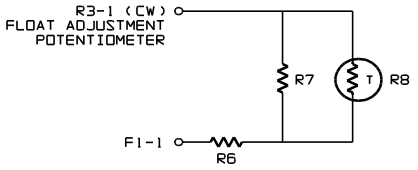
TITLE: COMBINED ALARM-STATUS MONITOR (CASM) SCR/SCRF SERIES BATTERY CHARGER

DRAWING No: EJ0837-XX REV 12A B

SCALE: NTS PART No: EJ0837-XX SHEET 1 OF 4

FILENAME [EJ0837-XX.PRT]




NOMINAL COMPONENT VALUES

| OUTPUT (VDC) | R6 | R7 | R8 (25°C) |
|---|---|---|---|
| 12 | 8.7 K | 11.3 K | 10.0 K |
| 24 | 39.2 K | 22.6 K | 30.0 K |
| 48 | 100.0 K | 40.2 K | 100.0 K |
| 130 | 301.0 K | 110.0 K | 100.0 K |
| 260 | 634.0 K | 200.0 K | 200.0 K |

CALIBRATION PROCEDURE:

1) PERFORM ALL OTHER FINAL TESTS BEFORE FINAL ADJUSTMENT OF FLOAT AND EQUALIZE VOLTAGES.

2) ADJUST FLOAT VOLTAGE AT 50% LOAD AND NOMINAL LINE TO VALUE SPECIFIED ON ORDER (OR LISTED IN SPEC).

3) SET CHARGER TO EQUALIZE MODE AND ADJUST EQUALIZE VOLTAGE TO VALUE SPECIFIED ON ORDER (OR LISTED IN SPEC).

4) RETURN CHARGER TO FLOAT MODE, MEASURE AND RECORD AMBIENT TEMPERATURE IN DEGREES CELCIUS.

6) REFER TO THE APPROPRIATE VOLTAGE / TEMPERATURE CURVE. ADJUST THE FLOAT VOLTAGE AT 50% LOAD AND NOMINAL LINE TO THE PROPER VALUE FOR THE AMBIENT TEMPERATURE.

NOTES:

1) THIS NETWORK REPLACES R2 IN THE FEEDBACK VOLTAGE DIVIDER.

2) AVERAGE TEMPERATURE COEFICIENT -2.5 mV/V/°C (-3.3 mV/CELL/°F @ 2.4 VPC).

3) SEE SHEET 2 OF 2 FOR MECHANICAL ASSEMBLY AND WIRING INSTRUCTIONS.

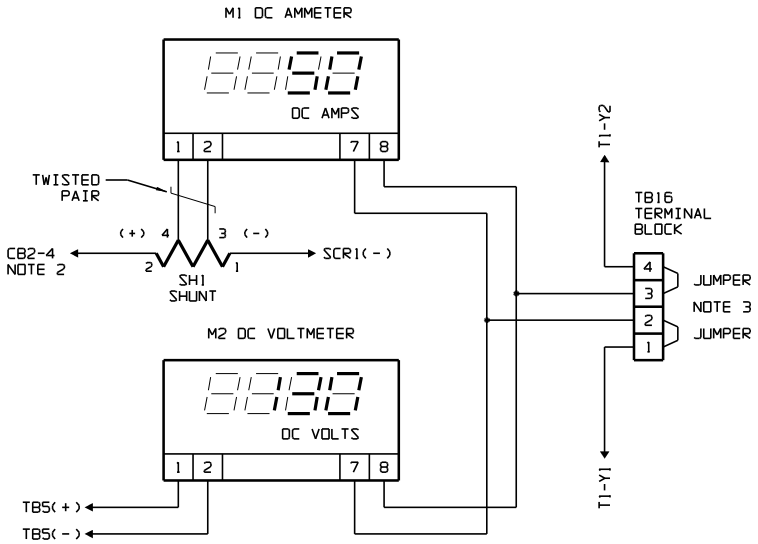
| REV | ECN No | DATE | APP |
|---|---|---|---|
| 5 | 10009 | 070293 | |
| 4 | 9871 | 051393 | SC |
| 3 | 6611 | 010890 | WCW |
| 2 | 5438 | 101088 | WKB |
| 0 | 4583 | 121887 | TGN |

THIRD ANGLE PROJECTION

DRAWN BY MC 062293
APPROVED WKB 062893
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE SCR/SCRF SERIES OPTION SCHEMATIC: INTERNAL TEMPERATURE COMPENSATION NETWORK (LEAD ACID)
DRAWING No EJ0826-XX REV 5A A
SCALE NTS PART No EJ0826-XX SHEET 1 OF 2

FILENAME [EJ0826-XX.PRT]




NOTES:

1) [not used]

2) IF CB2 IS NOT USED, THIS CONNECTION LEADS TO F2-1.

3) TO PROVIDE EXTERNAL POWER TO DIGITAL METERS, REMOVE JUMPERS AND APPLY 120VAC @ 3VA/METER TO TERMINALS 2 AND 3 ON TB16.

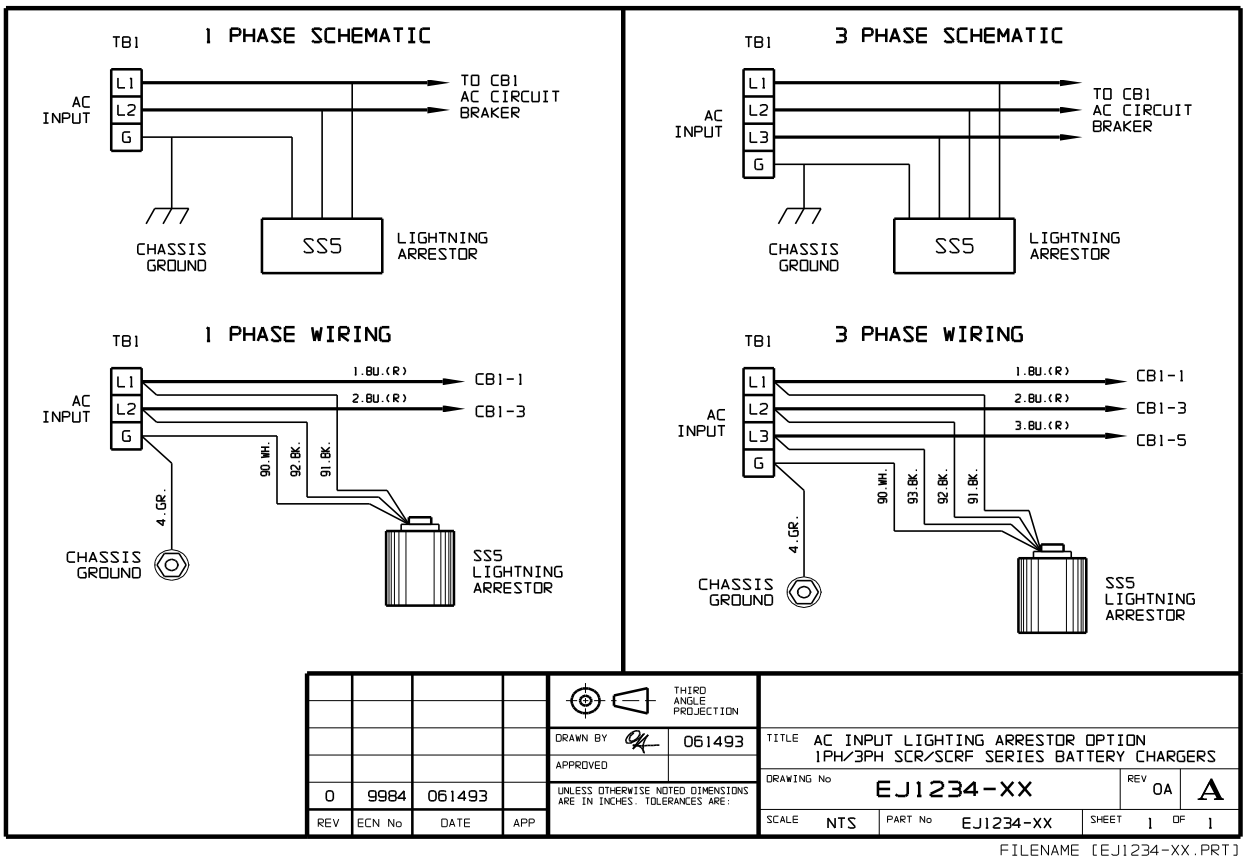
| REV | ECN No | DATE | APP |
|---|---|---|---|
| 5 | E0020 | 031000 | |
| 4 | 12220 | 071195 | MCT |
| 3A | 11014 | 051694 | WKB |
| 3 | 10261 | 083093 | WKB |
| 2 | 09993 | 061693 | WKB |

THIRD ANGLE PROJECTION

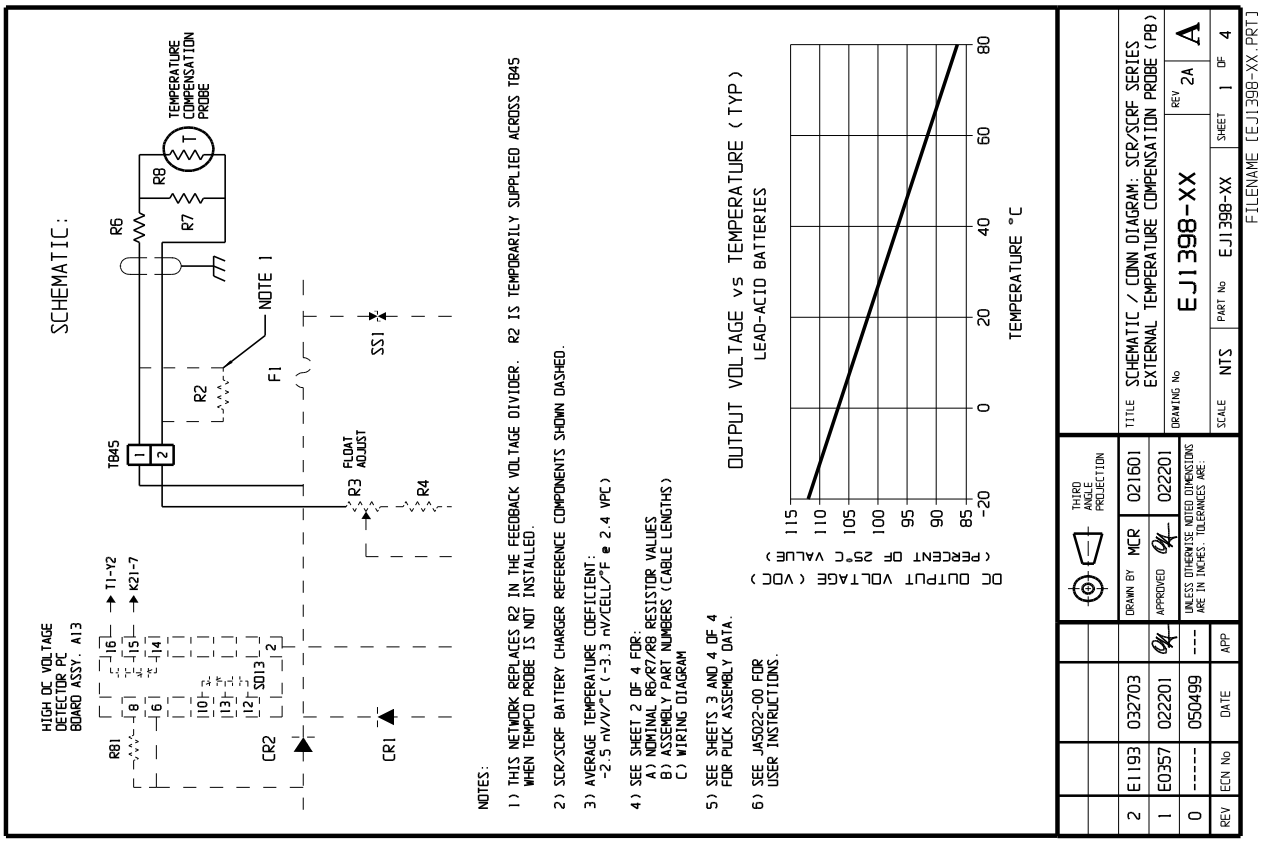
DRAWN BY CTA 061693
APPROVED WKB 062493
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE SCHEMATIC: SCR/SCRF SERIES 0.1% ACCURACY DIGITAL DC METERS
DRAWING No EJ0895-XX REV 5A A
SCALE NTS PART No EJ0895-XX SHEET 1 OF 2

FILENAME [EJ0895-XX.PRT]




FILENAME [EJ1234-XX.PRT]

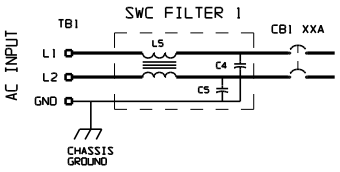



FILENAME [EJ1398-XX.PRT]

SCHEMATIC:
1PH AC SWC FILTER

1PH AC SWC FILTER
COMPONENTS:
C4
C5
L5

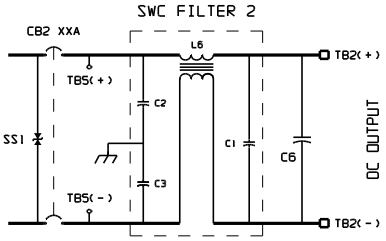
OTHER COMPONENTS
PART OF CHARGER
MAINFRAME



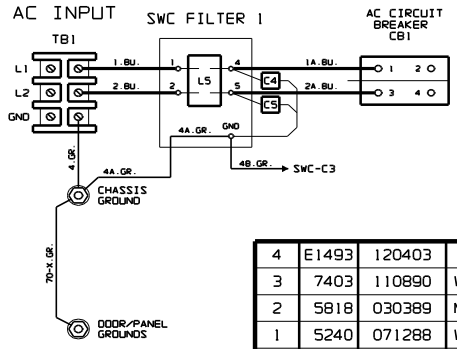

SCHEMATIC:
DC SWC FILTER

DC SWC FILTER
COMPONENTS:
C1
C2
C3
L6

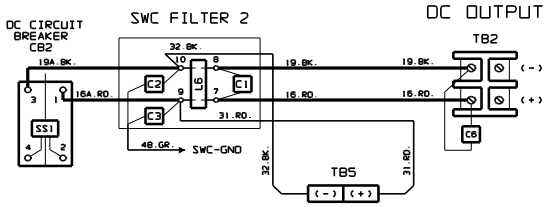
OTHER COMPONENTS
PART OF CHARGER
MAINFRAME




CONNECTION DIAGRAM:
1PH AC SWC FILTER




CONNECTION DIAGRAM:
DC SWC FILTER




| REV | ECN No | DATE | APP |
|---|---|---|---|
| 4 | E1493 | 120403 | |
| 3 | 7403 | 110890 | WKB |
| 2 | 5818 | 030389 | MCT |
| 1 | 5240 | 071288 | WAH |
| 0 | 1868 | 073089 | TPP |

THIRD ANGLE PROJECTION

DRAWN BY MCR 120403
APPROVED
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE SCR/SCRF SERIES BATTERY CHARGER
SWC FILTER OPTION - SINGLE PHASE INPUT

DRAWING No JE0121-00 REV 4 A

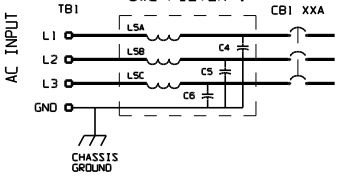
SCALE NTS PART No JE0121-00 SHEET 1 OF 1

FILENAME [JE0121-00.PRT]

SCHEMATIC:
3PH AC SWC FILTER

3PH AC SWC FILTER
COMPONENTS:
C4
C5
C6
L5A/B/C

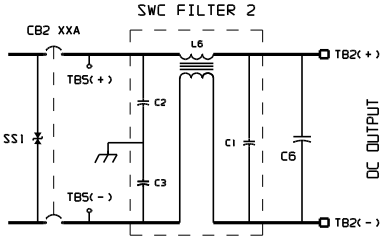
OTHER COMPONENTS
PART OF CHARGER
MAINFRAME



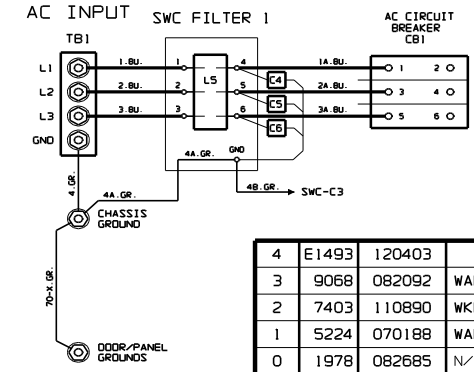

SCHEMATIC:
DC SWC FILTER

DC SWC FILTER
COMPONENTS:
C1
C2
C3
L6

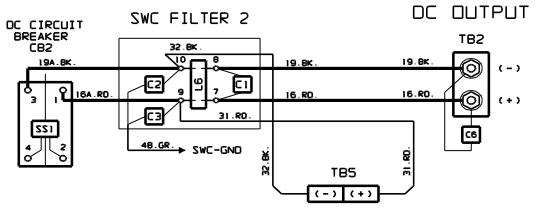
OTHER COMPONENTS
PART OF CHARGER
MAINFRAME




CONNECTION DIAGRAM:
3PH AC SWC FILTER




CONNECTION DIAGRAM:
DC SWC FILTER




| REV | ECN No | DATE | APP |
|---|---|---|---|
| 4 | E1493 | 120403 | |
| 3 | 9068 | 082092 | WAH |
| 2 | 7403 | 110890 | WKB |
| 1 | 5224 | 070188 | WAH |
| 0 | 1978 | 082685 | N/A |

THIRD ANGLE PROJECTION

DRAWN BY MCR 120403
APPROVED
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

TITLE SCR/SCRF SERIES BATTERY CHARGER
SWC FILTER OPTION - THREE PHASE INPUT

DRAWING No JE0126-00 REV 4 A

SCALE NTS PART No JE0126-00 SHEET 1 OF 1

FILENAME [JE0126-00.PRT]

# ELECTRICAL RATINGS AND REPLACEMENT PARTS

## **SCR/SCRF Series Battery Charger** (Single Phase Mainframe)

PLEASE CONTACT YOUR SALES REPRESENTATIVE FOR DATA ON MODELS NOT LISTED.

| SCR/SCRF BATTERY CHARGER MODEL | | | 12V-6A | 12V-12A | 12V-20A | 12V-25A | 24V-6A | 24V-12A | 24V-25A | 24V-50A | 24V-75A |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enclosure Type | | Style-1A | Style-1A | Style-1A | Style-1B | Style-1A | Style-1A | Style-1B | Style-1B | Style-2 |
| AC INPUT CURRENT (MAXIMUM) | | 120Vac | 2.6 | 3.8 | 6.0 | 7.5 | 5.7 | 8.8 | 16 | 26 | 39 |
| | | 240Vac | 1.3 | 1.9 | 3.0 | 3.8 | 2.8 | 4.4 | 7.4 | 13 | 19 |
| | | 480Vac | .7 | .9 | 1.5 | 1.9 | 1.4 | 2.2 | 4.7 | 6.5 | 9.7 |
| **SYMBOL** | **DESCRIPTION** | | **MANUFACTURER'S PART No.** | | | | | | | | |
| **C1/C2** | FILTER CAPACITOR | | RP0019-01 | | | | | | | | |
| **C3** | SNUBBER CAPACITOR | | RP0023-00 | | | | | | | | |
| **CB1** | AC INPUT CIRCUIT BREAKER | 120Vac | RE0015-03 | RE0015-03 | RE0015-04 | RE0015-04 | RE0015-04 | RE0015-04 | RE0015-06 | RE0015-09 | RE0015-12 |
| | | 208-240Vac | RE0015-03 | RE0015-03 | RE0015-03 | RE0015-04 | RE0015-03 | RE0015-03 | RE0015-04 | RE0015-06 | RE0015-07 |
| | | 380-480Vac | RE0015-03 | RE0015-03 | RE0015-03 | RE0015-04 | RE0015-03 | RE0015-03 | RE0015-03 | RE0015-04 | RE0015-05 |
| **CB2** | DC OUTPUT CIRCUIT BREAKER | | RE0015-24 | RE0015-25 | RE0015-26 | RE0015-28 | RE0015-24 | RE0015-25 | RE0015-28 | RE0015-34 | RE0015-36 |
| **CR1** | POLARITY DIODE | | RK0010-02 | RK0009-02 | RK0009-02 | RK0009-02 | RK0010-02 | RK0009-02 | RK0009-02 | RK0017-04 | RK0017-04 |
| **CR2** | BLOCKING DIODE | | RK0010-02 | RK0009-02 | RK0013-02 | RK0013-02 | RK0010-02 | RK0009-02 | RK0013-02 | RK0017-04 | RK0017-04 |
| **CR4 - CR6** | RECTIFIER DIODE | | part of SCR1/SCR2 | | | | | | | | |
| **F1/F2** | DC FUSE | | RE0001-19 | RE0001-20 | RE0001-22 | RE0003-01 | RE0001-19 | RE0001-20 | RE0003-01 | RE0004-06 | RE0004-09 |
| **XF1/ XF2** | DC FUSEHOLDER | | RE0013-00 | RE0013-00 | RE0013-00 | EI0053-00 | RE0013-00 | RE0013-00 | EI0053-00 | EI0068-00 | EI0068-00 |
| **L1** | MAIN INDUCTOR | | AP0564-00 | AP0564-00 | AP0565-00 | AP0565-00 | AP0564-00 | AP0564-00 | AP0565-00 | AP0481-00 | AP0808-00 |
| **L2** | FILTER INDUCTOR | | AP0564-00 | AP0564-00 | AP0565-00 | AP0565-00 | AP0564-00 | AP0564-00 | AP0565-00 | AP0481-00 | AP0314-00 |
| **M1** | DC OUTPUT AMMETER | | RB0003-01 | RB0003-02 | RB003-04 | RB003-04 | RB0003-01 | RB0003-02 | RB003-04 | RB0003-06 | RB0003-07 |
| **M2** | DC OUTPUT VOLTMETER | | RB0002-01 | | | | RB0002-02 | | | | |
| **R1** | BLEEDER / FEEDBACK RESISTOR | | RJ0035-27 | | | | RJ0022-02 | | | | |
| **R2** | VOLTAGE DIVIDER RESISTOR | | RJ0003-98 | | | | RJ0004-12 | | | | |
| **SCR1 - SCR2** | SILICON-CONTROLLED RECTIFIER MODULE | | RM0002-01 | RM0002-01 | RM0001-00 | RM0001-00 | RM0002-01 | RM0002-01 | RM0001-00 | RM0001-01 | RM0001-01 |
| **SH1** | DC AMMETER SHUNT | | - | - | - | - | - | - | - | RB0008-01 | RB0008-02 |
| **SS1** | DC OUPUT SURGE SUPPRESSOR | | RK0031-00 | | | | | | | | |
| **SS2 - SS4** | AC INPUT SURGE SUPPRESSOR | 120Vac | RK0031-00 | | | | | | | | |
| | | 208-240Vac | RK0038-00 | | | | | | | | |
| | | 380-480Vac | RK0038-01 | | | | | | | | |
| **T1** | POWER ISOLATION TRANSFORMER | 120/220/240 Vac | AA0650-00 | AA0652-00 | AA0654-00 | AA0654-00 | AA0656-00 | AA0656-00 | AB1250-00 | AB1540-00 | AB1256-00 |
| | | 480Vac | AA0651-00 | AA0653-00 | AA0655-00 | AA0655-00 | AA0657-00 | AA0657-00 | AB1251-00 | AB1542-00 | AB1257-00 |
| **TB1** | AC INPUT TERMINAL BLOCK | | RC0006-01 | RC0006-01 | RC0006-01 | RC0012-00 RC0012-01 | RC0006-01 | RC0006-01 | RC0012-00 RC0012-01 | RC0012-00 RC0012-01 | RC0014-00 RC0014-01 |
| **TB2** | DC OUTPUT TERMINAL BLOCK | | RC0006-00 | RC0006-00 | RC0006-00 | RC0012-00 RC0012-01 | RC0006-00 | RC0006-00 | RC0012-00 RC0012-01 | RC0014-00 RC0014-01 | FB0313-00 |

| **PARTS COMMON TO ALL SINGLE PHASE SCR/SCRF SERIES CHARGERS** | | | | | |
|---|---|---|---|---|---|
| SYM | PART NO. | DESCRIPTION | SYM | PART NO. | DESCRIPTION |
| **A1** | GK0058-81 | CONTROL MODULE PC BOARD (UNFILTERED) | **R4** | RJ0003-84 | VOLTAGE DIVIDER RESISTOR |
| **A1** | GK0058-82 | CONTROL MODULE PC BOARD (FILTERED-ELIMINATOR) | **R5** | RJ0014-06 | EQUALIZE ADJUSTMENT POTENTIOMETER |
| **C6** | RP0043-20 | SUPPRESSION CAPACITOR (24/48/130 VDC) | **SO1** | EJ0617-00 | PLUG FOR A1 PC BOARD |
| **C6** | RP0046-12 | SUPPRESSION CAPACITOR (260 VDC) | **SW1** | RD0001-00 | MANUAL FLOAT/EQUALIZE SWITCH |
| **DS1** | RA0001-05 | "AC ON" INDICATOR | **XA#** | EJ0616-00 | PC BOARD HOLDERS |
| **R3** | RJ0014-06 | FLOAT ADJUSTMENT POTENTIOMETER | **XC#** | PE0068-00 | FILTER CAPACITOR BRACKET |

TO ORDER PARTS, PLEASE CONTACT YOUR SALES REPRESENTATIVE.
PLEASE ORDER BY QUANTITY, PART NUMBER AND CIRCUIT SYMBOL FROM TABLES ABOVE.
HAVE YOUR BATTERY CHARGER MODEL NUMBER AND SERIAL NUMBER AVAILABLE.

# ELECTRICAL RATINGS AND REPLACEMENT PARTS

## SCR/SCRF Series Battery Charger (Single Phase Mainframe)

PLEASE CONTACT YOUR SALES REPRESENTATIVE FOR DATA ON MODELS NOT LISTED.

| SCR/SCRF BATTERY CHARGER MODEL | | | 24V-100A | 48V-6A | 48V-12A | 48V-16A | 48V-25A | 48V-35A | 48V-50A | 48V-75A | 48V-100A |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enclosure Type | | Style-3 | Style-1A | Style-1A | Style-1B | Style-1B | Style-1B | Style-2 | Style-2 | Style-3 |
| AC INPUT CURRENT (MAXIMUM) | | 120Vac | 52 | 8.2 | 14 | 18 | 29 | 40 | 51 | 71 | 94 |
| | | 240Vac | 26 | 4.1 | 7.0 | 9.0 | 15 | 20 | 26 | 36 | 47 |
| | | 480Vac | 13 | 2.0 | 3.5 | 4.5 | 7.3 | 10 | 13 | 18 | 24 |
| **SYMBOL** | **DESCRIPTION** | | **MANUFACTURER'S PART No.** | | | | | | | | |
| **C1/C2** | FILTER CAPACITOR | | RP0019-01 | | | | | | | | |
| **C3** | SNUBBER CAPACITOR | | RP0023-00 | | | | | | | | |
| **CB1** | AC INPUT CIRCUIT BREAKER | 120Vac | RE0015-17 | RE0015-04 | RE0015-06 | RE0015-06 | RE0015-08 | RE0015-10 | RE0015-13 | RE0015-17 | RE0015-19 |
| | | 208-240Vac | RE0015-10 | RE0015-03 | RE0015-04 | RE0015-05 | RE0015-06 | RE0015-07 | RE0015-08 | RE0015-12 | RE0015-13 |
| | | 380-480Vac | RE0015-06 | RE0015-03 | RE0015-03 | RE0015-03 | RE0015-04 | RE0015-04 | RE0015-05 | RE0015-07 | RE0015-08 |
| **CB2** | DC OUTPUT CIRCUIT BREAKER | | RE0217-03 | RE0015-24 | RE0015-25 | RE0015-38 | RE0015-28 | RE0015-31 | RE0015-34 | RE0015-36 | RE0217-03 |
| **CR1** | POLARITY DIODE | | RK0017-04 | RK0010-04 | RK0010-04 | RK0009-04 | RK0009-04 | RK0013-04 | RK0017-04 | RK0017-04 | RK0017-04 |
| **CR2** | BLOCKING DIODE | | RK0017-04 | RK0010-04 | RK0009-04 | RK0013-04 | RK0013-04 | RK0014-04 | RK0017-04 | RK0017-04 | RK0017-04 |
| **CR4 - CR6** | RECTIFIER DIODE | | part of SCR1/SCR2 | | | | | | | | |
| **F1/F2** | DC FUSE | | RE0004-10 | RE0001-19 | RE0001-20 | RE0001-21 | RE0003-01 | RE0003-04 | RE0004-06 | RE0004-09 | RE0004-10 |
| **XF1/ XF2** | DC FUSEHOLDER | | PART OF I/O PANEL | RE0013-00 | RE0013-00 | RE0013-00 | EI0053-00 | EI0053-00 | EI0068-00 | EI0068-00 | PART OF I/O PANEL |
| **L1** | MAIN INDUCTOR | | AP0339-00 | AP0306-00 | AP0306-00 | AP0565-00 | AP0565-00 | AP0379-01 | AP0481-00 | AP0833-00 | AP0827-00 |
| **L2** | FILTER INDUCTOR | | AP0339-00 | AP0306-00 | AP0306-00 | AP0565-00 | AP0565-00 | AP0379-01 | AP0481-00 | AP0833-00 | AP0339-00 |
| **M1** | DC OUTPUT AMMETER | | RB0003-08 | RB0003-01 | RB0003-02 | RB0003-03 | RB0003-04 | RB0003-05 | RB0003-06 | RB0003-07 | RB0003-08 |
| **M2** | DC OUTPUT VOLTMETER | | RB0002-02 | RB0002-03 | | | | | | | |
| **R1** | BLEEDER / FEEDBACK RESISTOR | | RJ0022-02 | RJ0022-03 | | | | | | | |
| **R2** | VOLTAGE DIVIDER RESISTOR | | RJ0004-12 | RJ0008-21 | | | | | | | |
| **SCR1 - SCR2** | SILICON-CONTROLLED RECTIFIER MODULE | | RM0001-01 | RM0002-01 | RM0002-01 | RM0001-00 | RM0001-00 | RM0001-00 | RM0001-01 | RM0001-01 | RM0001-01 |
| **SH1** | DC AMMETER SHUNT | | RB0008-03 | - | - | - | - | - | RB0008-01 | RB0008-02 | RB0008-03 |
| **SS1** | DC OUPUT SURGE SUPPRESSOR | | RK0031-00 | | | | | | | | |
| **SS2 - SS4** | AC INPUT SURGE SUPPRESSOR | 120Vac<br>208-240Vac<br>380-480Vac | RK0031-00<br>RK0038-00<br>RK0038-01 | | | | | | | | |
| **T1** | POWER ISOLATION TRANSFORMER | 120/220/240 Vac | AB1632-00 | AA0656-00 | AB1556-00 | AB1540-00 | AB1540-00 | AB1256-00 | AB1258-00 | AB1552-00 | AB1548-00 |
| | | 480Vac | AB1516-00 | AA0657-00 | AB1558-00 | AB1542-00 | AB1542-00 | AB1257-00 | AB1259-00 | AB1554-00 | AB1550-00 |
| **TB1** | AC INPUT TERMINAL BLOCK | | part of I/O panel | RC0006-01 | RC0006-01 | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0014-00<br>RC0014-01 | RC0014-00<br>RC0014-01 | FB0314-00 | part of I/O panel |
| **TB2** | DC OUTPUT TERMINAL BLOCK | | part of I/O panel | RC0006-00 | RC0006-00 | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0014-00<br>RC0014-01 | RC0014-00<br>RC0014-01 | FB0313-00 | part of I/O panel |

| PARTS COMMON TO ALL SINGLE PHASE SCR/SCRF SERIES CHARGERS | | | | | |
|---|---|---|---|---|---|
| SYM | PART NO. | DESCRIPTION | SYM | PART NO. | DESCRIPTION |
| **A1** | GK0058-81 | CONTROL MODULE PC BOARD (UNFILTERED) | **R4** | RJ0003-84 | VOLTAGE DIVIDER RESISTOR |
| **A1** | GK0058-82 | CONTROL MODULE PC BOARD (FILTERED-ELIMINATOR) | **R5** | RJ0014-06 | EQUALIZE ADJUSTMENT POTENTIOMETER |
| **C6** | RP0043-20 | SUPPRESSION CAPACITOR (24/48/130 VDC) | **SO1** | EJ0617-00 | PLUG FOR A1 PC BOARD |
| **C6** | RP0046-12 | SUPPRESSION CAPACITOR (260 VDC) | **SW1** | RD0001-00 | MANUAL FLOAT/EQUALIZE SWITCH |
| **DS1** | RA0001-05 | "AC ON" INDICATOR | **XA#** | EJ0616-00 | PC BOARD HOLDERS |
| **R3** | RJ0014-06 | FLOAT ADJUSTMENT POTENTIOMETER | **XC#** | PE0068-00 | FILTER CAPACITOR BRACKET |

TO ORDER PARTS, PLEASE CONTACT YOUR SALES REPRESENTATIVE.
PLEASE ORDER BY QUANTITY, PART NUMBER AND CIRCUIT SYMBOL FROM TABLES ABOVE.
HAVE YOUR BATTERY CHARGER MODEL NUMBER AND SERIAL NUMBER AVAILABLE.

# ELECTRICAL RATINGS AND REPLACEMENT PARTS

## **SCR/SCRF Series Battery Charger** (Single Phase Mainframe)

PLEASE CONTACT YOUR SALES REPRESENTATIVE FOR DATA ON MODELS NOT LISTED.

| SCR/SCRF BATTERY CHARGER MODEL | | 130V-6A | 130V-12A | 130V-16A | 130V-20A | 130V-25A | 130V-35A | 130V-50A | 260V-6A | 260V-16A |
|---|---|---|---|---|---|---|---|---|---|---|
| Enclosure Type | | Style-1B | Style-1B | Style-1B | Style-1B | Style-1B | Style-2 | Style-2 | Style-2 | Style-2 |
| AC INPUT CURRENT (MAXIMUM) | 120Vac | 19 | 31 | 42 | 50 | 58 | 81 | 115 | 28 | 74 |
| | 240Vac | 9.5 | 16 | 21 | 25 | 29 | 40 | 57 | 14 | 37 |
| | 480Vac | 4.8 | 7.8 | 10.5 | 13 | 15 | 20 | 29 | 7.1 | 19 |
| **SYMBOL** | **DESCRIPTION** | **MANUFACTURER'S PART No.** | | | | | | | | |
| **C1/C2** | FILTER CAPACITOR | RP0019-03 | | | | | | | RP0019-05 | |
| **C3** | SNUBBER CAPACITOR | RP0023-00 | | | | | | | | |
| **CB1** | AC INPUT CIRCUIT BREAKER 120Vac | RE0015-06 | RE0015-09 | RE0015-12 | RE0015-13 | RE0015-15 | RE0015-19 | RE0217-02 | RE0015-09 | RE0015-17 |
| | 208-240Vac | RE0015-05 | RE0015-06 | RE0015-09 | RE0015-09 | RE0015-10 | RE0015-17 | RE0015-17 | RE0015-06 | RE0015-12 |
| | 380-480Vac | RE0015-03 | RE0015-04 | RE0015-06 | RE0015-06 | RE0015-06 | RE0015-08 | RE0015-09 | RE0015-05 | RE0015-07 |
| **CB2** | DC OUTPUT CIRCUIT BREAKER | RE0015-24 | RE0015-25 | RE0015-38 | RE0015-26 | RE0015-28 | RE0015-31 | RE0015-34 | RE0015-24 | RE0015-38 |
| **CR1** | POLARITY DIODE | RK0009-04 | RK0009-04 | RK0009-04 | RK0009-04 | RK0009-04 | RK0013-04 | RK0017-04 | RK0009-05 | RK0009-05 |
| **CR2** | BLOCKING DIODE | RK0009-04 | RK0009-04 | RK0013-04 | RK0013-04 | RK0013-04 | RK0014-04 | RK0017-04 | RK0009-05 | RK0013-05 |
| **CR4 - CR6** | RECTIFIER DIODE | part of SCR1/SCR2 | | | | | | | | |
| **F1/F2** | DC FUSE | RE0001-19 | RE0001-20 | RE0001-21 | RE0001-22 | RE0003-01 | RE0003-04 | RE0004-06 | RE0002-09 | RE0002-11 |
| **XF1/ XF2** | DC FUSEHOLDER | RE0013-00 | RE0013-00 | RE0013-00 | RE0013-00 | EI0053-00 | EI0053-00 | EI0068-00 | RE0013-05 | RE0013-01 |
| **L1** | MAIN INDUCTOR | AP0306-00 | AP0306-00 | AP0604-00 | AP0872-00 | AP0604-00 | AP0950-00 | AP0482-00 | AP1114-00 | AP0872-00 |
| **L2** | FILTER INDUCTOR | AP0306-00 | AP0306-00 | AP0604-00 | AP0872-00 | AP0604-00 | AP0950-00 | AP0482-00 | AP0306-00 | AP0872-00 |
| **M1** | DC OUTPUT AMMETER | RB0003-01 | RB0003-02 | RB0003-03 | RB0003-04 | RB003-04 | RB0003-05 | RB0003-06 | RB0003-01 | RB0003-03 |
| **M2** | DC OUTPUT VOLTMETER | RB0002-04 | | | | | | | RB0002-05 | |
| **R1** | BLEEDER / FEEDBACK RESISTOR | RJ0023-02 | | | | | | | RJ0024-01 | |
| **R2** | VOLTAGE DIVIDER RESISTOR | RJ0008-32 | | | | | | | RJ0008-40 | |
| **SCR1 - SCR2** | SILICON-CONTROLLED RECTIFIER MODULE | RM0002-01 | RM0001-00 | RM0001-00 | RM0001-00 | RM0001-00 | RM0001-00 | RM0001-01 | RM0001-01 | RM0001-01 |
| **SH1** | DC AMMETER SHUNT | - | - | - | - | - | - | RB0008-01 | - | - |
| **SS1** | DC OUPUT SURGE SUPPRESSOR | RK0038-00 | | | | | | | RK0038-01 | |
| **SS2 - SS4** | AC INPUT SURGE SUPPRESSOR 120Vac<br>208-240Vac<br>380-480Vac | RK0031-00<br>RK0038-00<br>RK0038-01 | | | | | | | | |
| **T1** | POWER ISOLATION TRANSFORMER 120/220/240 Vac | AB1498-00 | AB1499-00 | AB1266-00 | AB1266-00 | AB1266-00 | AB1584-00 | AB1600-00 | AB1528-00 | AB1268-00 |
| | 480Vac | AB1594-00 | AB1532-00 | AB1267-00 | AB1267-00 | AB1267-00 | AB1586-00 | AB1602-00 | AB1530-00 | AB1269-00 |
| **TB1** | AC INPUT TERMINAL BLOCK | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0014-00<br>RC0014-01 | RC0014-00<br>RC0014-01 | FB0314-00 | FB0314-00 | RC0012-00<br>RC0012-01 | RC0014-00<br>RC0014-01 |
| **TB2** | DC OUTPUT TERMINAL BLOCK | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 | RC0014-00<br>RC0014-01 | RC0014-00<br>RC0014-01 | RC0012-00<br>RC0012-01 | RC0012-00<br>RC0012-01 |

**PARTS COMMON TO ALL SINGLE PHASE SCR/SCRF SERIES CHARGERS**

| SYM | PART NO. | DESCRIPTION | SYM | PART NO. | DESCRIPTION |
|---|---|---|---|---|---|
| **A1** | GK0058-81 | CONTROL MODULE PC BOARD (UNFILTERED) | **R4** | RJ0003-84 | VOLTAGE DIVIDER RESISTOR |
| **A1** | GK0058-82 | CONTROL MODULE PC BOARD (FILTERED-ELIMINATOR) | **R5** | RJ0014-06 | EQUALIZE ADJUSTMENT POTENTIOMETER |
| **C6** | RP0043-20 | SUPPRESSION CAPACITOR (24/48/130 VDC) | **SO1** | EJ0617-00 | PLUG FOR A1 PC BOARD |
| **C6** | RP0046-12 | SUPPRESSION CAPACITOR (260 VDC) | **SW1** | RD0001-00 | MANUAL FLOAT/EQUALIZE SWITCH |
| **DS1** | RA0001-05 | "AC ON" INDICATOR | **XA#** | EJ0616-00 | PC BOARD HOLDERS |
| **R3** | RJ0014-06 | FLOAT ADJUSTMENT POTENTIOMETER | **XC#** | PE0068-00 | FILTER CAPACITOR BRACKET |

TO ORDER PARTS, PLEASE CONTACT YOUR SALES REPRESENTATIVE.
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# ELECTRICAL RATINGS AND REPLACEMENT PARTS

## **SCR/SCRF Series Battery Charger** (Single Phase Mainframe)

PLEASE CONTACT YOUR SALES REPRESENTATIVE FOR DATA ON MODELS NOT LISTED.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **SCR/SCRF BATTERY CHARGER MODEL** | | | | | | | | | |
| Enclosure Type | | | | | | | | | |
| AC INPUT CURRENT (MAXIMUM) 120Vac 240Vac 480Vac | | | | | | | | | |
| **SYMBOL** | **DESCRIPTION** | **MANUFACTURER'S PART No.** | | | | | | | |
| **C1/C2** | FILTER CAPACITOR | | | | | | | | |
| **C3** | SNUBBER CAPACITOR | | | | | | | | |
| **CB1** | AC INPUT CIRCUIT BREAKER 120Vac 208-240Vac 380-480Vac | | | | | | | | |
| **CB2** | DC OUTPUT CIRCUIT BREAKER | | | | | | | | |
| **CR1** | POLARITY DIODE | | | | | | | | |
| **CR2** | BLOCKING DIODE | | | | | | | | |
| **CR4 - CR6** | RECTIFIER DIODE | | | | | | | | |
| **F1/F2** | DC FUSE | | | | | | | | |
| **XF1/ XF2** | DC FUSEHOLDER | | | | | | | | |
| **L1** | MAIN INDUCTOR | | | | | | | | |
| **L2** | FILTER INDUCTOR | | | | | | | | |
| **M1** | DC OUTPUT AMMETER | | | | | | | | |
| **M2** | DC OUTPUT VOLTMETER | | | | | | | | |
| **R1** | BLEEDER / FEEDBACK RESISTOR | | | | | | | | |
| **R2** | VOLTAGE DIVIDER RESISTOR | | | | | | | | |
| **SCR1 - SCR2** | SILICON-CONTROLLED RECTIFIER MODULE | | | | | | | | |
| **SH1** | DC AMMETER SHUNT | | | | | | | | |
| **SS1** | DC OUPUT SURGE SUPPRESSOR | | | | | | | | |
| **SS2 - SS4** | AC INPUT SURGE SUPPRESSOR 120Vac 208-240Vac 380-480Vac | | | | | | | | |
| **T1** | POWER ISOLATION TRANSFORMER 120/220/240 Vac 480Vac | | | | | | | | |
| **TB1** | AC INPUT TERMINAL BLOCK | | | | | | | | |
| **TB2** | DC OUTPUT TERMINAL BLOCK | | | | | | | | |

| **PARTS COMMON TO ALL SINGLE PHASE SCR/SCRF SERIES CHARGERS** | | | | | |
|---|---|---|---|---|---|
| SYM | PART NO. | DESCRIPTION | SYM | PART NO. | DESCRIPTION |
| **A1** | GK0058-81 | CONTROL MODULE PC BOARD (UNFILTERED) | **R4** | RJ0003-84 | VOLTAGE DIVIDER RESISTOR |
| **A1** | GK0058-82 | CONTROL MODULE PC BOARD (FILTERED-ELIMINATOR) | **R5** | RJ0014-06 | EQUALIZE ADJUSTMENT POTENTIOMETER |
| **C6** | RP0043-20 | SUPPRESSION CAPACITOR (24/48/130 VDC) | **SO1** | EJ0617-00 | PLUG FOR A1 PC BOARD |
| **C6** | RP0046-12 | SUPPRESSION CAPACITOR (260 VDC) | **SW1** | RD0001-00 | MANUAL FLOAT/EQUALIZE SWITCH |
| **DS1** | RA0001-05 | "AC ON" INDICATOR | **XA#** | EJ0616-00 | PC BOARD HOLDERS |
| **R3** | RJ0014-06 | FLOAT ADJUSTMENT POTENTIOMETER | **XC#** | PE0068-00 | FILTER CAPACITOR BRACKET |

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# REPLACEMENT PARTS

## SCR/SCRF Series Battery Charger Options (1PH/3PH)

| | | BATTERY CHARGER NOMINAL OUTPUT | 12 Vdc | 24 Vdc | 48 Vdc | 130 Vdc | 260 Vdc |
|---|---|---|---|---|---|---|---|
| **OPTION NUMBER** | **CIRCUIT SYMBOL** | **DESCRIPTION** | **MANUFACTURER'S PART NO.** | | | | |
| **EJ0083** | A2 | HLVA Alarm Control PC Board | GK0045-01 (specify dc voltage) | | | | |
| | DS3 | Low Voltage Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-01 | RA0001-06 |
| | DS4 | High Voltage Indicating Light | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 |
| | R57 | Power Supply Ballast Resistor | n/a | RJ0028-36 | RJ0015-33 | RJ0022-04 | RJ0022-05 |
| | R75 | DS3 Ballast Resistor | n/a | n/a | RJ0028-24 | RJ0035-42 | RJ0008-13 |
| | SO2 | Plug for A2 | EJ0617-00 | | | | |
| **EJ0084** | DS5 | Float Indicating Light | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 |
| | DS6 | Equalize Indicating Light | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 |
| | K6 | Switching Relay | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 |
| | SW4 | Float/Auto Equalize Switch | RD0001-01 | RD0001-01 | RD0001-01 | RD0001-01 | RD0001-01 |
| | TM4 | Percent Equalize Timer (0-72 hour) | RF0005-01 | RF0005-01 | RF0005-01 | RF0005-01 | RF0005-01 |
| **EJ0085** | DS2 | AC Failure Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-06 | RA0001-06 |
| | K1 | AC Failure Alarm Relay | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 |
| | R54 | Voltage Dropping Resistor | n/a | n/a | RJ0028-24 | n/a | RJ0008-13 |
| **EJ0086** | DS13 | Ground Detection Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-06 | RA0001-06 |
| | DS14 | Ground Detection Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-06 | RA0001-06 |
| | K2 | Positive Ground Detection Relay | RF0010-01 | RF0010-03 | RF0010-05 | RF0010-06 | RF0010-06 |
| | K3 | Negative Ground Detection Relay | RF0010-01 | RF0010-03 | RF0010-05 | RF0010-06 | RF0010-06 |
| | R59, R60 | Relay Ballast Resistors | RJ0003-44 | RJ0005-58 | RJ0007-67 | RJ0007-89 | RJ0015-48 |
| | R83, R84 | Lamp Ballast Resistors | n/a | n/a | RJ0028-24 | n/a | RJ0008-13 |
| | SW3 | Relay Reset Switch | RD0001-02 | RD0001-02 | RD0001-02 | RD0001-02 | RD0001-02 |
| **EJ0088** | DS8, DS9 | Ground Detection Indicating Lights | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-01 | RA0001-01 |
| | R50, R51 | Lamp Ballast Resistors | RJ0007-34 | RJ0005-55 | RJ0007-72 | RJ0035-42 | RJ0035-45 |
| **EJ0089** | DS8, DS9 | Ground Detection Indicating Lights | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-01 | RA0001-01 |
| | R50, R51 | Lamp Ballast Resistors | RJ0007-34 | RJ0005-55 | RJ0007-72 | RJ0035-42 | RJ0035-45 |
| | SW12 | Lamp/Ground Test Switch | RD0001-08 | RD0001-08 | RD0001-08 | RD0001-08 | RD0001-08 |
| **EJ0093** | DS5 | Float Indicating Light | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 |
| | DS6 | Equalize Indicating Light | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 |
| | SW7 | Float/Equalize Switch | RD0001-01 | RD0001-01 | RD0001-01 | RD0001-01 | RD0001-01 |
| **EJ0094** | SW8 | Ground Detection/Output Switch | RD0001-04 | RD0001-04 | RD0001-04 | RD0001-04 | RD0001-04 |
| | SW9 | Ground Detection Positive/Negative Switch | RD0001-01 | RD0001-01 | RD0001-01 | RD0001-01 | RD0001-01 |
| **EJ0095** | M4 | AC Voltmeter 120 Vac | RB0006-04 | RB0006-04 | RB0006-04 | RB0006-04 | RB0006-04 |
| | | AC Voltmeter 208 - 240 Vac | RB0006-05 | RB0006-05 | RB0006-05 | RB0006-05 | RB0006-05 |
| | | AC Voltmeter 380 - 480 Vac | RB0006-21 | RB0006-21 | RB0006-21 | RB0006-21 | RB0006-21 |
| **EJ0096** | DS5 | Float Indicating Light | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 |
| | DS6 | Equalize Indicating Light | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 |
| | TM3 | Manual Equalize Timer (0-72 hour) | RF0003-02 | RF0003-02 | RF0003-02 | RF0003-02 | RF0003-02 |
| **EJ0097** | TM3 | Manual Equalize Timer (0-72 hour) | RF0003-02 | RF0003-02 | RF0003-02 | RF0003-02 | RF0003-02 |

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# REPLACEMENT PARTS

## SCR/SCRF Series Battery Charger Options (1PH/3PH)

| | | BATTERY CHARGER NOMINAL OUTPUT | 12 Vdc | 24 Vdc | 48 Vdc | 130 Vdc | 260 Vdc |
|---|---|---|---|---|---|---|---|
| **OPTION NUMBER** | **CIRCUIT SYMBOL** | **DESCRIPTION** | **MANUFACTURER'S PART NO.** | | | | |
| **EJ0120** | A5 | Battery Discharging Alarm PC Board | GK0052-01 | GK0052-02 | GK0052-05 | GK0052-06 | GK0052-07 |
| | DS10 | Battery Discharging Alarm Indicating Light | RA0001-00 | RA0001-02 | RA0001-02 | RA0001-04 | RA0001-04 |
| | R71 | Ballast Resistor for A5 | n/a | RJ0007-52 | RJ0035-34 | RJ0022-04 | RJ0023-04 |
| | R82 | Ballast Resistor for DS10 | n/a | n/a | RJ0007-72 | n/a | RJ0008-13 |
| | SH3 | DC Current Shunt 25 - 40 Adc | RB0008-00 | RB0008-00 | RB0008-00 | RB0008-00 | RB0008-00 |
| | | DC Current Shunt 50 - 60 Adc | RB0008-01 | RB0008-01 | RB0008-01 | RB0008-01 | RB0008-01 |
| | | DC Current Shunt 75 Adc | RB0008-02 | RB0008-02 | RB0008-02 | RB0008-02 | RB0008-02 |
| | | DC Current Shunt 100 - 150 Adc | RB0008-04 | RB0008-04 | RB0008-04 | RB0008-04 | RB0008-04 |
| | | DC Current Shunt 175 - 250 Adc | RB0008-05 | RB0008-05 | RB0008-05 | RB0008-05 | RB0008-05 |
| | | DC Current Shunt 300 - 400 Adc | RB0008-10 | RB0008-10 | RB0008-10 | RB0008-10 | RB0008-10 |
| | SO5 | Plug for A5 | EJ0617-00 | | | | |
| | TB2 | DC Output Terminal 6 - 20 Adc | RC0006-01 | RC0006-01 | RC0006-01 | RC0012-00 | RC0012-00 |
| | | DC Output Terminal 25 - 30 Adc | RC0012-00 | RC0012-00 | RC0012-00 | RC0012-00 | RC0012-00 |
| | | DC Output Terminal 35 - 60 Adc | RC0014-00 | RC0014-00 | RC0014-00 | RC0014-00 | RC0014-00 |
| | | DC Output Terminal 75 Adc | FB0314-00 | FB0314-00 | FB0314-00 | part of I/O Panel | |
| **EJ0121** | M4 | AC Voltmeter 208 - 240 Vac | RB0006-05 | RB0006-05 | RB0006-05 | RB0006-05 | RB0006-05 |
| | | AC Voltmeter 380 - 480 Vac | RB0006-21 | RB0006-21 | RB0006-21 | RB0006-21 | RB0006-21 |
| | SW5 | Phase Selector Switch | RD0005-00 | RD0005-00 | RD0005-00 | RD0005-00 | RD0005-00 |
| **EJ0123** | AU1 | Common Alarm Buzzer | RA0004-00 | RA0004-00 | RA0004-00 | RA0004-00 | RA0004-00 |
| | R61 | Buzzer Ballast Resistor | n/a | n/a | n/a | RJ0015-46 | RJ0035-48 |
| | SW13 | Buzzer ON/OFF Switch | RD0001-00 | RD0001-00 | RD0001-00 | RD0001-00 | RD0001-00 |
| **EJ0127** | A3 | Charger Failure Alarm Control PC Board | GK0055-01 | GK0055-01 | GK0055-01 | GK0055-01 | GK0055-01 |
| | DS7 | Charger Failure Alarm Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-06 | RA0001-06 |
| | R52 | Ballast Resistor for A3 | n/a | RJ0028-37 | RJ0015-33 | RJ0022-04 | RJ0022-05 |
| | R85 | Ballast Resistor for DS7 | n/a | n/a | RJ0028-24 | n/a | RJ0008-13 |
| | SO3 | Plug for A3 | EJ0617-00 | | | | |
| **EJ0131** | CR52 | Zener Diode | n/a | n/a | RK0005-22 | RK0005-22 | RK0005-22 |
| | DS5 | Float Indicating Light | | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 |
| | DS6 | Equzlize Indicating Light | | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 |
| | K6 | AC Failure Relay | | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 |
| | K7 | Switching Relay | | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 |
| | R55 | Timing Resistor | | RJ0004-40 | RJ0004-40 | RJ0004-40 | RJ0004-40 |
| | R56 | Ballast Resistor for TM2 | | n/a | RJ0015-30 | RJ0020-03 | RJ0022-06 |
| | SW1 | Equalize / Auto-Equalize Switch | | RD0001-00 | RD0001-00 | RD0001-00 | RD0001-00 |
| | SW11 | Float Reset Switch | | RD0001-02 | RD0001-02 | RD0001-02 | RD0001-02 |
| | TM1 | Auto-Equalize Timer (0-72 hour) | | RF0034-00 | RF0034-00 | RF0034-00 | RF0034-00 |
| | TM2 | Time Delay Relay | | RF0007-00 | RF0007-00 | RF0007-00 | RF0007-00 |
| **EJ0133** | A6 | Load Sharing Control PC Board | EJ0144-00 | EJ0144-00 | EJ0144-00 | EJ0144-00 | EJ0144-00 |
| | SW10 | Load Sharing ON/OFF Switch | RD0001-00 | RD0001-00 | RD0001-00 | RD0001-00 | RD0001-00 |
| | TB4 | Load Sharing Signal Terminal Block | RC0005-02 | RC0005-02 | RC0005-02 | RC0005-02 | RC0005-02 |

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# REPLACEMENT PARTS

## SCR/SCRF Series Battery Charger Options (1PH/3PH)

| | | BATTERY CHARGER NOMINAL OUTPUT | | 12 Vdc | 24 Vdc | 48 Vdc | 130 Vdc | 260 Vdc |
|---|---|---|---|---|---|---|---|---|
| **OPTION NUMBER** | **CIRCUIT SYMBOL** | **DESCRIPTION** | | **MANUFACTURER'S PART NO.** | | | | |
| **EJ0134** | CT1 | AC Current Transformer | 75 Aac max | AT0057-01 | AT0057-01 | AT0057-01 | AT0057-01 | AT0057-01 |
| | | | 100 Aac max | AT0057-02 | AT0057-02 | AT0057-02 | AT0057-02 | AT0057-02 |
| | M3 | AC Ammeter | 10 Aac max | RB0006-00 | RB0006-00 | RB0006-00 | RB0006-00 | RB0006-00 |
| | | | 15 Aac max | RB0006-17 | RB0006-17 | RB0006-17 | RB0006-17 | RB0006-17 |
| | | | 20 Aac max | RB0006-01 | RB0006-01 | RB0006-01 | RB0006-01 | RB0006-01 |
| | | | 30 Aac max | RB0006-19 | RB0006-19 | RB0006-19 | RB0006-19 | RB0006-19 |
| | | | 50 Aac max | RB0006-02 | RB0006-02 | RB0006-02 | RB0006-02 | RB0006-02 |
| | | | 75 Aac max | RB0006-22 | RB0006-22 | RB0006-22 | RB0006-22 | RB0006-22 |
| | | | 100 Aac max | RB0006-06 | RB0006-06 | RB0006-06 | RB0006-06 | RB0006-06 |
| **EJ0135** | CT1 - CT3 | AC Current Transformer | 60:5 ratio | AT0057-00 | AT0057-00 | AT0057-00 | AT0057-00 | AT0057-00 |
| | | | 75:5 ratio | AT0057-01 | AT0057-01 | AT0057-01 | AT0057-01 | AT0057-01 |
| | | | 100:5 ratio | AT0057-02 | AT0057-02 | AT0057-02 | AT0057-02 | AT0057-02 |
| | M3 | AC Ammeter | 10 Aac max | RB0006-23 | RB0006-23 | RB0006-23 | RB0006-23 | RB0006-23 |
| | | | 20 Aac max | RB0006-25 | RB0006-25 | RB0006-25 | RB0006-25 | RB0006-25 |
| | | | 30 Aac max | RB0006-26 | RB0006-26 | RB0006-26 | RB0006-26 | RB0006-26 |
| | | | 50 Aac max | RB0006-27 | RB0006-27 | RB0006-27 | RB0006-27 | RB0006-27 |
| | | | 75 Aac max | RB0006-22 | RB0006-22 | RB0006-22 | RB0006-22 | RB0006-22 |
| | | | 100 Aac max | RB0006-06 | RB0006-06 | RB0006-06 | RB0006-06 | RB0006-06 |
| | SW6 | Phase Selector Switch | | RD0006-01 | RD0006-01 | RD0006-01 | RD0006-01 | RD0006-01 |
| **EJ0137** | A18 | Current Limit Alarm PC Board | | GK0045-05 | GK0045-05 | GK0045-05 | GK0045-05 | GK0045-05 |
| | DS24 | Current Limit Alarm Indicating Light | | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 |
| | K24 | Auxiliary Alarm Relay | | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 |
| | R77 | Ballast Resistor for A18 | | n/a | RJ0028-36 | RJ0015-32 | RJ0022-04 | RJ0022-05 |
| | SO18 | Plug for A18 | | EJ0617-00 | | | | |
| **EJ0138** | M7 | DC Ammeter | 6 - 15 Adc | RB0003-19 | RB0003-19 | RB0003-19 | RB0003-19 | RB0003-19 |
| | | | 16 - 25 Adc | RB0003-17 | RB0003-17 | RB0003-17 | RB0003-17 | RB0003-17 |
| | | | 26 - 50 Adc | RB0003-22 | RB0003-22 | RB0003-22 | RB0003-22 | RB0003-22 |
| | | | 51 - 75 Adc | RB0003-18 | RB0003-18 | RB0003-18 | RB0003-18 | RB0003-18 |
| | | | 76 - 100 Adc | RB0003-13 | RB0003-13 | RB0003-13 | RB0003-13 | RB0003-13 |
| | | | 101 - 200 Adc | RB0003-15 | RB0003-15 | RB0003-15 | RB0003-15 | RB0003-15 |
| | | | 201 - 300 Adc | RB0003-20 | RB0003-20 | RB0003-20 | RB0003-20 | RB0003-20 |
| | | | 301 - 500 Adc | RB0003-21 | RB0003-21 | RB0003-21 | RB0003-21 | RB0003-21 |
| | SH2 | DC Current Shunt | 51 - 75 Adc | RB0008-01 | RB0008-01 | RB0008-01 | RB0008-01 | RB0008-01 |
| | | | 76 - 100 Adc | RB0008-02 | RB0008-02 | RB0008-02 | RB0008-02 | RB0008-02 |
| | | | 101 - 200 Adc | RB0008-04 | RB0008-04 | RB0008-04 | RB0008-04 | RB0008-04 |
| | | | 201 - 300 Adc | RB0008-05 | RB0008-05 | RB0008-05 | RB0008-05 | RB0008-05 |
| | | | 301 - 500 Adc | RB0008-10 | RB0008-10 | RB0008-10 | RB0008-10 | RB0008-10 |
| | TB2 | DC Output Terminal | 6 - 20 Adc | RC0006-01 | RC0006-01 | RC0006-01 | RC0006-01 | RC0006-01 |
| | | | 25 - 35 Adc | RC0012-00 | RC0012-00 | RC0012-00 | RC0012-00 | RC0012-00 |
| | | | 40 - 60 Adc | RC0014-00 | RC0014-00 | RC0014-00 | RC0014-00 | RC0014-00 |
| | | | 75 Adc | FB0314-00 | FB0314-00 | FB0314-00 | FB0314-00 | FB0314-00 |

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# REPLACEMENT PARTS

## SCR/SCRF Series Battery Charger Options (1PH/3PH)

| | | BATTERY CHARGER NOMINAL OUTPUT | 12 Vdc | 24 Vdc | 48 Vdc | 130 Vdc | 260 Vdc |
|---|---|---|---|---|---|---|---|
| **OPTION NUMBER** | **CIRCUIT SYMBOL** | **DESCRIPTION** | **MANUFACTURER'S PART NO.** | | | | |
| **EJ0141** | AU1 | Common Alarm Buzzer | RA0004-00 | RA0004-00 | RA0004-00 | RA0004-00 | RA0004-00 |
| | K8 | Common Alarm Relay | RF0010-01 | RF0010-03 | RF0010-03 | RF0010-06 | RF0010-06 |
| | R61 | Ballast Resistor for AU1 | n/a | n/a | n/a | RJ0015-46 | RJ0035-48 |
| | R63 | Ballast Resistor for K8 | n/a | n/a | RJ0015-33 | n/a | RJ0015-48 |
| | SW13 | Buzzer ON/OFF Switch | RA0001-00 | RA0001-00 | RA0001-00 | RA0001-00 | RA0001-00 |
| **EJ0143** | A8 | End of Discharge Alarm Control PC Board | GK0045-01 (specify dc voltage) | | | | |
| | DS12 | End of Discharge Alarm Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-01 | RA0001-06 |
| | R58 | Ballast Resistor for A8 | n/a | RJ0028-36 | RJ0015-33 | RJ0022-04 | RJ0022-05 |
| | R76 | Ballast Resistor for DS12 | n/a | n/a | RJ0028-24 | RJ0035-42 | RJ0008-13 |
| | SO8 | Plug for A8 | EJ0617-00 | | | | |
| **EJ0145** | CB6 | Cabinet Heater AC Input Circuit Breaker | RE0015-05 | | | | |
| | R68 | Cabinet Heater Strip(s) | RG0003-00 | | | | |
| | TB6 | Heater Strip AC Input Terminal Block | RC0006-00 | | | | |
| | TB14 | Interface Terminal Block | RC0006-00 | | | | |
| | TH1 | Cabinet Heater Control Thermostat | RG0002-01 | | | | |
| **EJ0155** | A11A | High/Low AC Voltage Alarm Control PC Board | GK0045-01 (12 Vdc) | | | | |
| | A11B | High/Low AC Voltage Alarm Detector PC Board | EN0003-00 | | | | |
| | DS17 | Low AC Voltage Alarm Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-01 | RA0001-06 |
| | DS18 | High AC Voltage Alarm Indicating Light | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 |
| | R78 | Ballast Resistor for A11A | n/a | RJ0028-36 | RJ0015-33 | RJ0022-04 | RJ0022-05 |
| | R87 | Ballast Resistor for DS17 | n/a | n/a | RJ0028-24 | RJ0035-42 | RJ0008-13 |
| | SO11A | Plug for A11A | EJ0617-00 | | | | |
| **EJ0439** | DS19 | Over-Temperature Alarm Buzzer | RA0004-01 | RA0004-01 | RA0004-01 | RA0004-01 | RA0004-01 |
| | DS23 | Over-Temperature Alarm Indicating Light | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 |
| | K18 | Over-Temperature Alarm Relay | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 |
| | SW17 | Buzzer ON/OFF Switch | RD0001-00 | RD0001-00 | RD0001-00 | RD0001-00 | RD0001-00 |
| | TH2 | Over-Temperature Thermostat | RG0002-05 | RG0002-05 | RG0002-05 | RG0002-05 | RG0002-05 |
| **EJ0592** | A13 | Hight DC Voltage Shutdown Control PC Board | GK0045-01 (specify dc voltage) | | | | |
| | DS20 | High DC Voltage Shutdown Indicating Light | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 | RA0001-06 |
| | K21 | High DC Voltage Shutdown Control Relay | RF0010-08 | RF0010-08 | RF0010-08 | RF0010-08 | RF0010-08 |
| | R81 | Ballast Resistor for A13 | n/a | RJ0028-36 | RJ0015-33 | RJ0022-04 | RJ0022-05 |
| | SO13 | Plug for A13 | EJ0617-00 | EJ0617-00 | EJ0617-00 | EJ0617-00 | EJ0617-00 |
| | SW14 | Hight DC Voltage Shutdown Reset Switch | RD0002-01 | RD0002-01 | RD0002-01 | RD0002-01 | RD0002-01 |
| **EJ0803** | K32 | AC Failure Time Delay Relay (5 second) | RF0016-00 | | | | |
| **EJ0826** | R6 | Temperature Comp. Series Resistor (Lead Acid) | RJ0062-90 | RJ0063-57 | RJ0064-00 | RJ0064-46 | RJ0076-77 |
| | R7 | Temperature Compensation Parallel Resistor | RJ0063-05 | RJ0063-34 | RJ0060-58 | RJ0064-04 | RJ0064-29 |
| | R8 | Temperature Compensation Thermistor | RG0010-04 | RG0010-03 | RG0010-01 | RG0010-01 | (2) RG0010-01 |

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# REPLACEMENT PARTS

## SCR/SCRF Series Battery Charger Options (1PH/3PH)

| | | BATTERY CHARGER NOMINAL OUTPUT | 12 Vdc | 24 Vdc | 48 Vdc | 130 Vdc | 260 Vdc |
|---|---|---|---|---|---|---|---|
| **OPTION NUMBER** | **CIRCUIT SYMBOL** | **DESCRIPTION** | **MANUFACTURER'S PART NO.** | | | | |
| **EJ0837** | A24 | Combined Alarm-Status Monitor 1 Form-C<br>Control PC Board 2 Form-C | EN0014-82<br>EN0014-83 | EN0014-82<br>EN0014-83 | EN0014-82<br>EN0014-83 | EN0014-82<br>EN0014-83 | EN0014-82<br>EN0014-83 |
| | DS26 | High DCVoltage Alarm Indicating Light | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 |
| | DS27 | Low DC Voltage Alarm Indicating Lights | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 |
| | DS28 | High AC Voltage Alarm Indicating Light | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 |
| | DS29 | Low AC Voltage Alarm Indicating Lights | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 |
| | DS30 | Charger Failure Alarm Indicating Light | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 |
| | DS31 | Positive Ground Detection Indicating Light | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 |
| | DS32 | Negative Ground Detection Indicating Light | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 | RA0008-00 |
| | R102 | Ballast Resistor for A24 | RJ0007-32 | RJ0035-25 | RJ0035-32 | RJ0023-03 | RJ0024-02 |
| | R103 | Prescaler Network Resistor | RJ0003-90 | RJ0004-07 | RJ0004-16 | RJ0004-26 | RJ0004-34 |
| | R105 | Prescaler Network Resistor | RJ0003-90 | RJ0004-04 | RJ0004-14 | RJ0004-25 | RJ0004-32 |
| | R104 | Prescaler Network Resistor | RJ0003-98 | RJ0003-98 | RJ0003-98 | RJ0003-98 | RJ0003-98 |
| | R106 | Prescaler Network Resistor | RJ0003-98 | RJ0003-98 | RJ0003-98 | RJ0004-00 | RJ0003-98 |
| | R107 | Ground Detection Scaling Resistor | n/a | n/a | n/a | n/a | n/a |
| | SO12 | Plug for A24 | RC0035-01 | | | | |
| | SW20 | Lamp Test Switch | RD0002-00 | RD0002-00 | RD0002-00 | RD0002-00 | RD0002-00 |
| | TB15 | Remote Alarm Terminal Block(s) | RC0108-16 | RC0108-16 | RC0108-16 | RC0108-16 | RC0108-16 |
| **EJ0862** | CR9 | AC Failure Time Delay Relay Regulator Diode | n/a | n/a | n/a | n/a | RK0005-38 |
| | DS2 | AC Failure Alarm Indicating Light | RA0001-00 | RA0001-01 | RA0001-01 | RA0001-06 | RA0001-06 |
| | K1 | Line Sensing Relay | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 | RF0010-00 |
| | K30 | AC Failure Time Delay Relay | RF0015-05 | RF0015-09 | RF0015-13 | RF0015-01 | RF0015-01 |
| | R46 | Ballast Resistor for K30 | n/a | n/a | n/a | n/a | RJ0007-96 |
| | R54 | Ballast Resistor for DS2 | n/a | n/a | RJ0028-24 | n/a | RJ0008-13 |
| **EJ0869** | DS5 | Float Indicating Light | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 | RA0001-05 |
| | DS6 | Equalize Indicating Light | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 | RA0001-04 |
| | SW7 | Equalize / Timer Switch | RD0001-04 | RD0001-04 | RD0001-04 | RD0001-04 | RD0001-04 |
| | TM3 | Manual Equalize Timer (0-72 hour) | RF0003-02 | RF0003-02 | RF0003-02 | RF0003-02 | RF0003-02 |
| **EJ0895** | M1 | Digital DC Ammeter 6 - 16 Adc | RB0025-10 | | | | |
| | | Digital DC Ammeter 20 - 40 Adc | RB0025-12 | | | | |
| | | Digital DC Ammeter 50 - 125 Adc | RB0025-14 | | | | |
| | | Digital DC Ammeter 150 - 250 Adc | RB0025-16 | | | | |
| | | Digital DC Ammeter 300 - 600 Adc | RB0025-19 | | | | |
| | M2 | Digital DC Voltmeter | RB0025-00 | | | | |
| | SH1 | DC Ammeter Shunt 6 - 16 Adc | RB0008-17 | | | | |
| | | DC Ammeter Shunt 20 - 40 Adc | RB0008-00 | | | | |
| | | DC Ammeter Shunt 50 - 125 Adc | RB0008-03 | | | | |
| | | DC Ammeter Shunt 150 - 250 Adc | RB0008-05 | | | | |
| | | DC Ammeter Shunt 300 - 600 Adc | RB0008-18 | | | | |
| **EJ0967** | DS43 | Common Alarm Buzzer for CASM (EJ0837) | RA0004-00 | | | | |
| | SW13 | Buzzer Control Switch | RD0001-00 | | | | |

TO ORDER PARTS, PLEASE CONTACT YOUR SALES REPRESENTATIVE.
PLEASE ORDER BY QUANTITY, PART NUMBER AND CIRCUIT SYMBOL FROM TABLES ABOVE.
HAVE YOUR BATTERY CHARGER MODEL NUMBER AND SERIAL NUMBER AVAILABLE.

# SECTION X
# MANUAL SPECIFICATIONS

**DOCUMENT NUMBER:**

The internal text and graphics contained within this manual are controlled by the battery charger manufacturer's internal part number (**JA5035-00**). Revision level and dates for this part are listed below. These controls supercede all other available dates. The first two and last two pages of this manual are reserved for company-specific front and back cover artwork. Any document numbers, revision levels, or revision dates featured on the first two or last two pages of this manual refer to the cover artwork only.

**DOCUMENT INFORMATION:**

| | |
|---|---|
| Document Number: | **JA5035-00** |
| Revision Level: | **2** |
| Engineering Change Number: | **20053** |
| Electronic Filename: | [JA5035-00.pdf] |
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**ON-LINE AVAILABILITY:**

Electronic versions of this SCR/SCRF Series Battery Charger manual, saved in Adobe Acrobat Portable Document Format (**PDF**), are readily available online for downloading and printing. Please contact your sales representative for document availability, or visit the manufacturer's web site listed on the back cover of this manual.

**STANDARD DRAWINGS:**

Standard drawings for the SCR/SCRF Series Battery Charger, saved in Adobe Acrobat Portable Document Format (**PDF**), are readily available online for downloading and printing. Please contact your sales representative for standard drawing availability, or visit the manufacturer's web site listed on the back cover of this manual.

**PARTS DATA PACKAGE:**

Any job-specific custom Parts Data Package supplied with this battery charger and/or this manual, supercede the standard parts listed on pages 53-61.

**CUSTOM DRAWINGS:**

A customized record drawing package is available for your SCR/SCRF Series battery charger, featuring an itemized internal component layout, electrical schematic with component ratings, and a full connection diagram. If the standard drawings featured in this manual are not sufficient, please contact your sales representative for drawing availability from the battery charger manufacturer.

Any job-specific custom drawings supplied with this battery charger and/or this manual, supercede the standard drawings featured on pages 28 and 32-52. The standard drawings and corresponding page numbers featured in these sections may not be included with custom printed manuals, when job-specific custom drawings are supplied.

# SCR/SCRF Series Battery Charger
# JD5022-00 *Preventive Maintenance Procedure*

| MAINTENANCE DATE | PERFORMED BY |
|---|---|
| | |

| **Step** (standard features) | **Instructions** | **Results** |
|---|---|---|
| **Clean battery charger** | • All vents clean and open.<br>• Remove dust and debris from inside of unit. | ☐ OK<br>☐ OK |
| **Check all electrical connections and wiring** | • TB1 and TB2 connections all tight.<br>• Internal wiring connections tight, slip-on connectors fully seated. Wire and lug insulation in good condition.<br>• Terminations at battery or bus are tight and corrosion free. | ☐ OK<br>☐ OK<br>☐ OK |
| **Check ac input voltage** | • Measure at TB1-L1, TB1-L2 & TB1-L3 (3 Phase only) using ac voltmeter. Value must be within +10%, -12% of nominal. | Input<br>_____ Vac |
| **Check dc output voltage** | • Measure at TB2(+) and TB2(-) using dc voltmeter. Value should agree with front panel voltmeter within 2%, and must be correct values for your battery. If the charger is using a temperature compensation probe, see the curve in Section VII of user's manual to determine correct battery voltage. | Float<br>_____ Vdc<br>Equalize<br>_____ Vdc |
| **Check ripple voltage** | • Measure at battery terminals using ac voltmeter set to milliVolts scale.<br>• Check against specification listed on charger's Data Nameplate. | Ripple<br>_____ mVac |
| **Exercise front panel controls** | • Switch from Float to Equalize, then back to Float. | ☐ OK |
| | • Verify front panel meters functional | ☐ Volts OK<br>☐ Amps OK |
| | • Verify adjustment capabilities of float and equalize potentiometers. | ☐ Float OK<br>☐ Equalize OK |
| **Check voltage settings** | • Verify voltage setting per battery manufacturer recommendations.<br>• Utilize float and equalize potentiometers to make any required adjustments. See Section IV of user's manual. | ☐ Float OK<br>☐ Equalize OK |
| **Final checks** | • Close and latch front panel door.<br>• Restore charger to normal operation. | ☐ OK<br>☐ OK |

| **Step** (optional features) | **Instructions** | **Results** |
|---|---|---|
| **Check alarm settings** | • See Section V of SCR/SCRF Series battery charger user's manual for calibration of alarms. | ☐ HVDC OK<br>☐ LVDC OK |
| **Combined Alarm Status Monitor (CASM)** | • See service instruction JD0036-00 for CASM alarm adjustments<br>• Test integrity of LEDs by pressing "lamp test" button on front panel. | ☐ OK |
| **Check integrity of remote wiring** | • Internal temperature compensation network wiring. See instruction JA5022-00 and Section VII of user's manual.<br>• Temperature compensation remote probe. See instruction JA5022-00 and Section VII of user's manual. | ☐ OK<br>☐ OK |

| **Step** (10-year repair) | **Instructions** | **Results** |
|---|---|---|
| **Replace capacitors** | • See supplied Parts Data Package report or standard replacement parts table for battery charger manufacturer's part number of optional dc filtering electrolytic capacitors (C1/C2).<br>• Order and replace capacitors | ☐ OK |

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GNB Industrial Power, a division of Exide Technologies, is a global leader in network power applications including communication/data networks, UPS systems for computers and control systems, electrical power generation and distribution systems, as well as a wide range of other industrial standby power applications. With a strong manufacturing base in both North America and Europe and a truly global reach (operations in more than 80 countries) in sales and service, GNB Industrial Power is best positioned to satisfy your backup power needs locally as well as all over the world.

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GNB Industrial Power takes pride in its commitment to a better environment. Its Total Battery Management program, an integrated approach to manufacturing, distributing and recycling of lead acid batteries, has been developed to ensure a safe and responsible life cycle for all of its products.

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